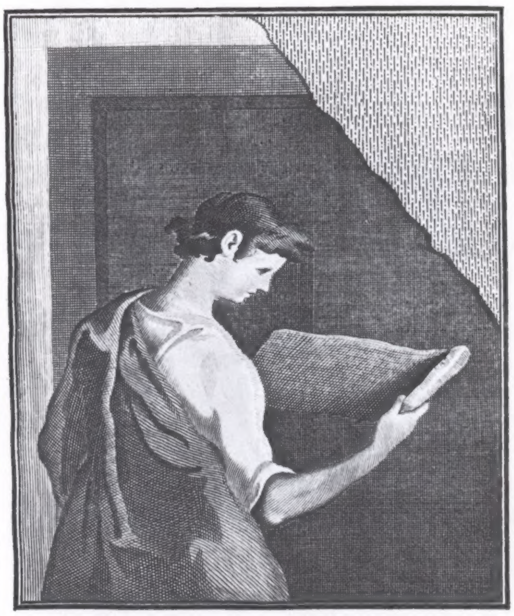

Seventeen hundred and fifty copies of this Volume have been printed for the use of the members of the Royal Institute, and for that of Allied and other kindred Societies, Public Libraries, and Educational Institutions, throughout the British Empire and in Foreign Countries.

TRANSACTIONS

OF

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS

VOL. VIII. NEW SERIES, 1892

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From a photograph.

PROFESSOR DONALDSON

PRESIDENT 1863-65. ROYAL GOLD MEDALLIST 1851.

The Royal Institute of British Architects

INCORPORATED SEVENTH OF WILLIAM IV. AND FIFTIETH OF VICTORIA

TRANSACTIONS: VOL. VIII. NEW SERIES

FIFTY-EIGHTH YEAR OF FOUNDATION

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LONDON

PUBLISHED AT THE ROYAL INSTITUTE OF BRITISH ARCHITECTS, 9 CONDUIT STREET, HANOVER SQUARE, W.

1892

CONTENTS.

THE R.I.B.A. TRANSACTIONS, VOL. VIII. NEW SERIES, 1892.

*** The Volume contains, including the Frontispiece, 180 Illustrations in the Text.

[*Entered at Stationers' Hall*]

The Royal Institute of British Architects

INCORPORATED SEVENTH OF WILLIAM IV. AND FIFTIETH OF VICTORIA

THE SESSION 1891-92.

THE OPENING MEETING of the Session—the fifty-seventh—was held on Monday, 2nd November 1891, when Mr. J. MACVICAR ANDERSON delivered his first Presidential Address* to the members of the Institute, and gave expression to a wish that some one better qualified than himself had been chosen to preside over their deliberations. Conscious of many deficiencies which their kindness ignored when they placed him in the Chair, he was none the less sensible of the confidence reposed in him, and was resolved to do his best to justify it by grudging neither time nor trouble in endeavouring to promote the prosperity of the Institute, and the best interests of the profession.

Of the many subjects of interest to them, there was, perhaps, none which more directly affected the profession, through the medium of the Institute, than that of Examination. The PRESIDENT deemed it, therefore, superfluous to offer any apology for occupying time in a review—retrospective and prospective—of the subject. The attention of the Institute would shortly have to be directed to the propriety or otherwise of establishing an Examination for admission to the class of Fellows; and if he referred particularly to that now, it was not certainly with the intention of forestalling the deliberate judgment of the Council, by whom it had yet to be considered, and whom he had in no way consulted, collectively or individually, but because he thought

* The Address, in its entirety, is printed in *The R.I.B.A. Journal*, Vol. VIII. pp. 21–35.

it desirable that the subject should be brought under the notice of members, with the view of being maturely thought over, prior to any decision being arrived at.

The President was, of course, aware that some within the Institute as well as outside of it were opposed to the policy of Examination, and considering it prejudicial to the highest interests of the profession, deprecated its extension. To such, especially those who were members, he urged that the day had gone by for raising objection or inaugurating opposition. No one could allege that the policy was not maturely considered prior to its adoption in 1882, and its subsequent confirmation by Royal Charter in 1887. Any who now found themselves honestly opposed to it should feel loyally bound by the decision of the majority; and if on principle unable to take an active part in the scheme of Examination, they should at least avoid any action which might tend to injure or to minimise the influence of the Institute in the honest endeavour to raise the standard of knowledge and efficiency, and so promote the welfare and credit of the profession.

Members were aware that the Charter of 1887 enacted not merely that "every person desiring to be admitted an Associate shall be required to pass "or to have passed such Examination or Examinations as may be directed "by the Royal Institute," but also that "after the expiration of five years from "the date of this Our Charter, the Royal Institute shall have power to declare "that every person desiring to be admitted a Fellow shall be required to have "passed such Examination or Examinations as may be directed by the Royal "Institute." Thus, while the Qualifying Examination for Associates was made compulsory, the institution of a similar Examination for Fellows was permissive only. It was significant that a date should have been specified on and after which a declaration might be made relating to an Examination for Fellows, showing that the possibility—if no more—of instituting such an Examination had been at that time contemplated by the Institute. The specified period on and after which it was permissible to make a declaration on the subject would expire next March, and it seemed to him, therefore, by no means premature to invite their attention to the matter now. There were, of course, several methods of dealing with the subject: for example, the powers granted by the Charter being permissive, the Institute might elect to take no action, or to declare that it was expedient to defer taking action, or to declare that on and after a specified date no one—except under certain conditions—should be admitted a Fellow who had not passed such Examination as the Institute might have established. In order to assist in forming a

correct judgment, it was pertinent to inquire what had been the result of the compulsory Examination for Associates established in 1882. For the purpose of comparison, it would be only fair to exclude the two years immediately preceding that date, during which an exceptional influx of Associates occurred. The President proposed, therefore, to take the eight Sessions from 1872 to 1880, and to compare them with the eight corresponding years in the succeeding decade, viz. 1882 to 1890. During the former period, the number of Associates who were elected was 246, or an average of thirty-one per annum; while in the latter period the number of Associates who were elected was 328, or an average of forty-one per annum. The latter average would have been still larger had the whole of the 533 candidates who applied to be examined, passed; or had the whole 366 who were passed, been elected. It was, moreover, worthy of note that since the year 1887, when the compulsory Examination for Associates was confirmed by Royal Charter, a remarkable increase in the number of applicants had occurred, for in the four succeeding Sessions, 1887–88 to 1890–91, there were no fewer than 375 candidates, of whom 262 were elected, being an average of sixty-five per annum. It thus appeared that while prior to the institution of the compulsory Examination in 1882 the average of annual elections was only thirty-one, since that date the annual average had been forty-one; and further, that since the confirmation of the Examination by Royal Charter the annual average had been sixty-five. These were facts which could not be controverted, the significance of which was remarkable. Bearing in mind that the abnormal number of Associates who were admitted in the two years immediately preceding the establishment of the compulsory Examination must have reacted prejudicially against the number of candidates for some years thereafter, the figures he had quoted could only be regarded with extreme gratification, for they afforded irrefragable evidence that the compulsory Examination had not exercised a deterrent effect so far as Associates were concerned, but, on the contrary, had actually formed an incentive and an inducement to join the Institute. That result might surprise some, but it was really no more than might have been anticipated, for it was obvious that membership acquired by means of the test of Examination became a much more valuable and valued possession than if it had been acquired only by means of a money payment.

The result, therefore, of nine years' experience of the compulsory Examination for Associates was, that the public had the guarantee that there were at least 376 of the rising generation of architects who had proved by

that test that they possessed such technical knowledge of architecture as had justified the Institute in enrolling them as Associates in pursuance of its chartered rights.

It was well known that study, unless with a definite object in view, was apt to be desultory, and was often neglected. In order to pass that Examination a systematic course of study had necessarily to be engaged in, a vast amount of useful knowledge was acquired; and who would say that those 376 Associates of the Institute were not better men and would not be better architects from the enforced study and the acquired knowledge that they owed to the compulsory Examination? Now, the President asked, seeing that Examination had resulted in the addition of so large a number of qualified Associates to the list of their members, why should not a similar result attend the extension of the same policy to the class of Fellows? The question was not so much, Why should Fellows be subjected, before election, to such a qualifying test? as, Why should they be excluded from advantages which the other class of members had derived from it? Surely there was nothing in the relative constitution of the two classes which could render it undesirable that a treatment, eminently successful and beneficial in the case of the one, should not be applied to the case of the other. The Institute deliberately adopted in 1882 the policy of Examination as the qualification for membership as Associates, and it would be no more than consistent if in 1892 it took advantage of the permissive powers of the Charter, and extended the same policy for membership as Fellows. Not to do so, indeed, would seem to imply one of two things—either unaccountable inconsistency, or the conviction that the policy had failed as regards Associates—an assumption which would be untenable and absurd in view of the facts and figures placed before them.

As the result of a careful review of the whole subject, the President felt no hesitation in expressing the decided opinion, that, in pursuance of the permissive powers of the Charter, the Institute should next year declare that, on and after a date to be specified, "every person desiring to be admitted a Fellow shall be required to have passed such Examination or Examinations as "may be directed by the Royal Institute."

In the event, however, of that policy being adopted, it should be understood that the words of the Charter, "But in special cases the Council shall "have power to dispense with such Examination or Examinations," should be liberally interpreted for a period of years, for the obvious reason that there were men now in the profession enjoying extensive practice, to whom, should

they propose to join the Institute, it would be manifestly absurd to apply the test of Examination.

That there were difficulties to be anxiously and carefully considered the President fully realised; but to say that there were difficulties to face was to tell them only what was common to all human enterprise: if regarded with timidity, they became rapidly exaggerated—if manfully wrestled with, they dissolved like hillside mist before the rising sun. To go no further, there arose on the threshold the question of Examiners. Perhaps all were not aware of the arduous nature of the labours of the Board of Examiners, labours which were entirely gratuitous, which incurred a grave sacrifice of time—in other words, money—and involved a great deal of consideration and study. For these labours, freely contributed during the last nine years by the Chairman and Members of the Board of Examiners, in carrying out and developing the Examination for Associates, the Institute owed a deep debt of gratitude which no mere words could adequately express. It was too much to expect a continuance of such gratuitous labours; and if, in addition to the existing Examinations, another should be instituted, the question of some form of recognition would have to be considered. That, however, was not a difficulty which ought to be regarded as insuperable; for although their funds might at present be somewhat straitened from causes to which he would refer, it was clear that means must be provided for the efficient support of an organisation which he looked on as vital to the best interests of the Institute.

The Institute had perhaps enough to pay its way, but not much more. Mr. Macvicar Anderson would like to see a much larger margin than had ever existed between its income and expenditure, and to provide such a margin was the goal to which members should seriously strive to attain; for although there was perhaps no particular object in amassing a large capital, it would certainly be desirable to add to their present vested funds, and thereby provide for future extension of premises, or for the acquisition of others more suited to their continual expansion; and it would be no less desirable to be able to set apart a yearly sum for the remuneration of Examiners, and to contribute towards the encouragement of professional education in such forms as might from time to time appear best. The President was far from thinking that there were not good reasons for the steady increase of their expenditure. The position which the Institute had of late years assumed in taking a more aggressive attitude in respect to public questions of architectural interest; the organisation of the Standing Committees; the machinery of the Scheme of Examination; the opposition to some and the support of other Bills in Parlia-

ment; the extension of its relations to Allied and Colonial Societies, were all causes, and legitimate causes, of increased expenditure which had to be met out of income. Each of these causes contributed to the necessity of an increased staff, in order to carry on efficiently the work of the Institute. But, while granting all that, he maintained that they were not justified in living up to their income, but that they should, on the contrary, live well within it. How was that to be accomplished? Obviously by adopting one of two possible alternatives. Either they must reduce expenditure or increase income. In respect to the former, he did not say it was impossible; but after careful consideration, and guided by many years' experience of the working of the Institute, he did say that he could discover no considerable item of expenditure that could be saved without detriment to their welfare and influence. There remained the other alternative—the expansion of income—in which, in his judgment, was to be found the true solution. It must be assumed that the Fellows and Associates of this Institute did value membership, or they would not be where they were. Why, then, should they continue selfishly to enjoy privileges, when, by exercising a more liberal spirit, others might be led to participate in them?

There was probably no more legitimate or more hopeful method of attaining that end than by means of the Societies in Scotland, Ireland, and the provinces which the Institute, by virtue of the powers of the Charter, had admitted to alliance. The Institute did not claim merely to represent metropolitan, but British architects; hence it now had twelve Allied Societies, and at the next Business Meeting it would be his privilege to propose that the Dundee Institute of Architecture, Science, and Art be admitted to alliance, thus increasing the number to thirteen. By means of such alliances they were kept in touch with representatives of local opinion and practice at the principal centres of life in the kingdom. The interest of all was identical, and could not fail to be promoted by united action. The President desired to see the Institute strengthened by admission to its ranks of more members of the Allied Societies, by whom the advantages of membership would year by year be increasingly appreciated, in proportion as year by year they became more fully realised by the public. Moreover, when the Institute was called on to advise a Department of State, it added emphasis to its counsel when, as in a recent instance, such counsel was confirmed by the cordial support of its Allied Societies.

To those whose professional practice lay within the metropolitan area, much inconvenience had of late years been experienced by the complications

resulting from the numerous statutory additions which had been made at different times to the Metropolitan Building Act of 1855. It was satisfactory, therefore, to know that the Local Government Board had proposed to introduce a "London Building Law (Consolidation) Bill," the object of which was stated to be "to consolidate the Metropolitan Building Acts" and "certain "sections of the London Council (General Powers) Act 1890." That would prove an undoubted convenience and advantage so far as it went. But it would only deal with one half, and that the less serious half, of the question. The Metropolitan Building Acts were admitted by all who had occasion to refer to them to require not only consolidation, but amendment. Some clauses, if not obsolete, had been so successfully evaded as to have become practically so; some, if rigidly enforced, inflicted hardship; while, on the other hand, they contained no enactment respecting such subjects as foundations, drainage, and sanitation, which vitally affected the health and welfare of the community. Hence when, in August, the President of the Local Government Board courteously forwarded a copy of the proposed Consolidation Bill and invited suggestions thereon, the PRESIDENT had not hesitated, after consultation with Mr. ARTHUR CATES and the officers of the Practice Standing Committee, to represent the importance, or rather the necessity, of accompanying the measure by an Amendment Bill, inasmuch as only by means of consolidation and amendment would the Building Acts be made to meet the requirements of the present day. The Practice Standing Committee, during the last two years, had been engaged in the serious task, involving great labour and research, of preparing a draft of a suggested Bill* which, when approved by the Council, would be forwarded to the President of the Local Government Board; and he hoped that the issue might be the passing in due time of a Consolidated and Amended Building Act, such as the necessities of the time required.

A review of the architectural events of the year would be incomplete without some reference to the new departure of the Architectural Association embodied in its curriculum. The able and lucid exposition given by the President, Mr. BAGGALLAY, and the exhaustive discussion which ensued, rendered it needless to attempt any delineation of the scheme now, and Mr MACVICAR ANDERSON referred to it only that he might embrace the opportunity of heartily commending it to the sympathy and support of the profession. Fully realising the difficulties with which they might have to contend, but undaunted

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* See Mr. Hall's Paper on "London Building Legislation" and the accompanying "Suggestions for a Draft Bill for the Codification and Amendment of the Metropolitan Building Acts," pp. 105-172.

by fear of failure, the members of the Association deliberately faced them; and, although they could not of course command success, they had certainly deserved it, by the judgment and determination they had displayed; and it was gratifying to learn that already a fair and encouraging measure of success had attended the launching of their new curriculum.

Among the numerous architectural competitions of the past year there was one which, alike from the magnitude of the work and from the manner in which the competition had been inaugurated, deserved more than a mere passing notice—the limited competition for the completion of the South Kensington Museum.

Members might differ in their ideas as to the system of competitions. There were those who, at the outset of their career, looked to them as one of the few opportunities for making themselves known, and regarded them consequently with favour. There were those who, having made their mark, in the first instance, by winning the prize in a competition for a public work, naturally were not prepared to condemn the system, even though in principle it might not entirely meet with their approval. There were, again, those who, like himself, had never engaged in competitions, because they believed them to be very nearly an unmixed evil, and not to be conducive to the real welfare of the profession. The motive which should inspire all design was the attainment of Beauty and Fitness, but, as human nature was constituted, the motive apt to be supreme in competitive design was the production of a result not necessarily the best, but in any case the one which was likely to find favour with the judges. That meant working for a low, not a high standard. An artist should seek to attain Perfection—if he did not he would never come near it—and to set up any other or less worthy standard, was to part with the inspiration which alone led to excellence in art, or indeed any intellectual pursuit.

Without, however, entering more fully into that question, the President emphasised one feature in the recent competition for the completion of the South Kensington Museum, which appeared to him to be specially worthy of comment and approval. In a national work such as that, no one could have cavilled had the Government themselves nominated the architects who were to be invited to engage in the competition, but they had been evidently actuated by the desire to make the best as well as the most fairly representative selection. Hence, having limited the number of competitors to eight, they nominated four, and requested the Council of the Royal Institute of British Architects to nominate the other four. The laudable desire to consult the

profession through its representatives in a matter of national importance was, he thought, highly creditable to the Government, and demanded recognition at their hands. Needless to add that the Council took every pains to fulfil conscientiously the trust reposed in them. The satisfactory arrangements for this competition were completed in the appointment by Government of Mr. Waterhouse as assessor, who at the time worthily occupied the position of President of the Institute, and whose wide experience in such matters constituted of itself a guarantee for an impartial and a just decision.

The Congress of Hygiene and Demography, which was held in London in August, and proved so great a success, treated of some subjects which were of interest to members of their profession. There was not perhaps much to say that they had not heard before, of architecture in relation to the health of the community from a practical point of view, and it was possibly for that reason that Sir Arthur Blomfield, as President of the Architectural Section, devoted his inaugural address to the subject of Hygiene in relation to Art, which with the suggestive treatment it received at his hands, could not fail to create considerable interest. The subject of Open Spaces occupied some of the time of the Congress, and to those who, like themselves, were denizens of a densely populated city, no argument was required to demonstrate its importance. There were, perhaps, few cities so well provided with open spaces as London; but, on the other hand, there was no city that more required them, for there was none with so teeming a population, increasing year by year with such fabulous strides. Essential as it was, however, with the view of promoting the health of the community, to provide parks and gardens wherever practicable, it was if possible even more so to make their streets worthier of the name of open spaces than they could now be said to be. Narrow streets and lofty houses were the natural and inevitable result of concentration. When people must live within a prescribed limit it was necessary to pack close; land assumed a fictitious value, and in order to secure a return on capital invested, houses—which could not be extended laterally—were carried to an abnormal height. That, being the outcome of circumstances beyond their control, constituted a difficulty for which it was not easy to suggest a remedy. Something might be done by legislation. The London Council (General Powers) Act 1890 had already prescribed a statutory limit to the height of buildings, which was so far good as being a step in the right direction. He could not but think, however, that this limit was excessive, and certainly too great to exercise any hygienic effect. In theory the true restriction would be to regulate the height of buildings by the width of the

streets in which they stood, but obviously such a rule could not be applied to Central London without inflicting injustice. It was necessary, therefore, to prescribe a general limit, and to allow no departure beyond it except with the sanction, specially obtained, of the County Council; and he was disposed to advocate that such limit should be fixed at seventy feet, instead of ninety feet as prescribed by the Act of last year. They could not, however, hope to effect much in the direction desired without the sympathy and concurrence of landowners. The interest of the freeholder was no doubt to get as much as the leaseholder would give; that was human nature, and moreover confirmed by the law of political economy—supply and demand: as demand increased, value would be enhanced, and *vice versâ*. But it was no less true that the real interest of the landlord was not always best consulted by the exaction of the full pound of flesh, and the President suggested that large landowners in London would do well to adopt the more enlightened policy of considering concurrently with their own interests the general welfare of the public, by inaugurating such improvements and granting such concessions as the exceptional circumstances of the huge metropolis demanded. In illustration of its feasibility, he referred to the liberal and enlightened policy displayed by the Duke of Westminster in the management of the Grosvenor estate, by increasing the width of streets and restricting the height of houses. Such a policy meant the sacrifice of so much rent-bearing land, as well as the acceptance of a smaller ground-rent than would be obtained without restriction of height; but, besides conferring a distinct advantage on the public, it must in the long run react for the benefit of the landowner himself by rendering his estate cheerful and attractive. It was by the adoption of such an enlightened open-space policy that landowners in London might contribute materially to the hygienic welfare of the community, and he commended it to their favourable consideration, as well as to that of their agents and advisers.

During the last six months inconvenience had arisen from the Strike of the Carpenters and Joiners of London, and the Lock-out by the Master-Builders which ensued. All must have deplored the necessity—if necessity there were—for resorting to such methods of dealing with the constantly-recurring disputes between the representatives of Capital and Labour, necessarily destructive as they must to a great extent be of that feeling of mutual confidence and respect which should subsist between employer and employed. The strike in question was the result of a claim on the part of the men for shorter hours and a higher rate of pay per hour—a claim which was resisted by the masters on the ground that it would increase the cost of

labour to the extent of at least 11 per cent., while, in their opinion, the state of trade would not justify any increase at all. Mr. Macvicar Anderson had not much faith in the interference of outsiders in Trade disputes, because, although no doubt actuated by the best of motives in offering their services, they were not always qualified by the possession of technical knowledge for the position they sought to occupy; but when, by virtue of his official position as President of the Institute, he was approached by the parties to the dispute, and when, as the result of a conference, they mutually agreed to refer their differences to his arbitration, and abide by his decision, he had not felt at liberty to decline the proposal. The position was a most arduous one, involving grave responsibility, and his award would be the result of anxious consideration and exhaustive inquiry. Meanwhile it was something to be thankful for, that in many a saddened home the glad tidings had been welcomed, and that the miseries and privations which had been the necessary accompaniments of the Carpenters' Strike had now terminated.

Contemporary architecture exhibited vigour, originality of treatment, and many features that commanded admiration, even amid much that, in London at least, was discouraging. When, for example, they reflected that of the thousands of houses erected yearly in this metropolis the vast majority were not designed by architects, but by the *employés* of speculator-builders, one was tempted to despair of the domestic architecture of London; and it seemed strange that, in face of the patent fact, the public and the daily press persistently made architects responsible for abortions with which they had had nothing whatever to do. It was bad enough to be deprived of the opportunity, except in comparatively rare instances, of showing what their domestic architecture might be if designed by specially educated artists; but it was monstrous that, although so deprived, they should yet be held responsible for the grotesque productions of men who were uneducated, and whose minds were innocent alike of refinement and taste. To bring about so magic a transformation as that the architecture of London might become the work of architects, would require the wand of an æsthetic Prospero; but something might possibly be attained by more prosaic means. The President understood, for example, that in granting new leases the Duke of Westminster stipulated in his building agreements that architects should be employed, again setting an example which other large landowners would do well to emulate, not so much on the lower ground of encouraging the employment of architects, as on the higher ground of improving by their employment the street architecture of London.

The PRESIDENT did not mean to say that it necessarily followed that every product of an architect's brain must be beautiful and command admiration; true, one could point to many examples where the work of an architect was conspicuous, amid everyday surroundings, by its taste and refinement: such, for instance, as the charming little residence at one corner of Cadogan Square, designed by the late Mr. STREET, a glance at which was sufficient to betray the artist's hand. But truth compelled the admission, that, in the midst of much that was meritorious and beautiful, there was not a little to regret in the work of contemporary architects, and it behoved them not to cast stones. It was written some 3,000 years since, by one who was acknowledged to have been the wisest of men: "The thing that hath been, it is that which shall "be; and that which is done, is that which shall be done; and there is no "new thing under the sun." Obviously that doctrine did not find expression in the architecture of these latter days, in much of which there seemed to be, too often, an overstrained and unnatural craving for novelty. Some recent buildings, indeed, would seem to declare: Perish fitness, perish consistency, perish beauty, but at all hazards, Novelty! "Now," said the PRESIDENT, "do not misunderstand me; do not imagine that "I fail to appreciate the freshness of original treatment, or that I advocate "adherence to dull monotony. Far from it. By all means indulge the fancy "in the production of original compositions; give free rein to the imagina-"tion in designing novel devices of detail or of ornament—so long as both "are restricted within the sacred confines of beauty, for 'a thing of beauty "'is a joy,' for which no novelty, however striking, will compensate. When "beauty is deliberately sacrificed, as it frequently is, for the mere craze of "novelty, the genius of Architecture is insulted, and her place usurped by "another and a less worthy goddess. In the words of Sir Joshua Reynolds: "'What has pleased, and continues to please, is likely to please again. "'Hence are derived the rules of Art; and on this immovable foundation they "'stand.'"

There was such a thing as selfishness in design, continued the PRESIDENT —it might not be so common as the same quality in life, but it could not be said to be rare: the indulgence in quaint personal conceits or idiosyncrasies, not necessarily beautiful because novel; instead of the manly effort to curb mere selfish quixoticisms, and to produce results pleasing to refined taste, because in harmony with what is beautiful. But it was surely possible to be unselfish in art as in life, and to indulge in almost infinite variety of treatment without offending the educated taste of others by disregarding those

principles of artistic design which the testimony of past generations had approved as contributing to beauty; and one could only transgress such established canons of art at the risk of probable if not certain failure. A noticeable instance of selfishness in architecture was afforded by the additions to King's College in course of erection at the eastern end of the river front of Somerset House, which, one might have fancied, would have been held sacred from innovation or injury. It was with astonishment and grief that he saw one of the grandest public buildings in London wantonly sacrificed to the unneighbourly selfishness of modern utilitarianism.

True principles of design should never be set aside for any considerations of novelty, however tempting. To insist on that was not to restrict freedom in design, or to put a drag on imagination. The words of the wise man which he had quoted, if applied to the principles of art, were as true to-day as they were the day they had been written, for those principles were immutable. The great artists of the world had recognised them in all ages. Nay, they might go further, and reverently declare that in all the wondrous and infinitely various creations of the Great Architect of the Universe such laws were to be traced. All the creations of nature were controlled by law; but within such restriction what infinite variety! So might they in their architectural creations conform to established canons of art, and yet freely indulge the fancy in infinite variety of treatment, whether of form, or ornament, or colour. In contemporary architecture he longed to see the more apparent recognition of such controlling principles of design: even in their too common absence he discerned elements of hope and promise, the true development of which would, if he mistook not, inaugurate the advent of pure classical taste. Indulging this hope, he saw in the not far distant future a sober vision of Architecture worthily commanding admiration whose characteristics it was not difficult to define: simplicity, without which there was no true greatness in art or in life; breadth and symmetry, without which there was no dignity; the absence of quaint though picturesque insignificances, which destroyed repose; above and beyond all, the supreme acknowledgment and expression of the Beautiful.

THE PRESENTATION OF PRIZES took place on Monday, the 25th January 1892, when the PRESIDENT delivered to the assembled students and others an Address, the theme of which was the Art of Planning.* Mr. MACVICAR ANDERSON, alluding to the title of the subject he had selected, said that no doubt there were those who regarded such a designation as a contradiction in terms, for it was to be feared that not a few considered planning as, at the best, a very prosaic part of an architect's work— to whose poetic fancies the idea of elevating it to the dignity of an art might appear to be a sort of architectural blasphemy. There were others who, without going so far as that, did not hesitate to relegate planning to an inferior and subordinate place, not worthy of the exercise of the higher and artistic faculties of the designer—a constructive skeleton, as it were, admirable it might be in its mechanism, but which the architect must clothe with grace before it can be admitted to the sacred courts of art. The PRESIDENT declared that such views of planning were thoroughly fallacious, and injurious to the best interests of architecture, because derogating to a commonplace utilitarianism what was really an integral and inseparable part of the art, the root from which grew the loftiest conceptions—the suggestive source from which sprang all that followed.

Thus viewed they would see at once that it was impossible to exaggerate or over-estimate the importance of the study of planning. It might indeed be safely asserted that there was no study in which the human mind could engage on the results of which the comfort, convenience, and happiness of society so much depended. That was claiming a good deal, perhaps, but no more than the study properly demanded. It was not his purpose to emphasise utilitarianism, but they should not forget that every building was designed for use ; to say so was not to derogate from art, because the highest art was displayed when a building was so designed as most successfully to fulfil its purpose by combining fitness with beauty. Thus the primary field for the exhibition of the architect's art was planning. What was architecture ? Was it the mere clothing of the structure? or was it the artistic design of the structure itself ? Unquestionably the latter ; and if so, how could the study of planning be other than artistic work, the primary stirring of the dry bones out of chaos, and the life inspiration which created out of them the useful and the beautiful ? Planning was not the mere casual throwing together of so many forms, the chance disposition of so many lines representing walls,

* The Address in its entirety, is printed in *The R.I.B.A. Journal*, Vol. VIII. pp. 133–138.

enclosing so many haphazard spaces representing rooms; it involved the exercise of imagination. The design of the plan was the medium for educing this quality, just as much as the design of the elevation. It was customary, no doubt, to hear the word design applied to the elevation much more than to the plan; but the one was really just as much design as the other: consequently the plan afforded an opportunity for the display of artistic power just as much as the elevation. Not only so, but a true artist while studying and elaborating his plan had a mental drawing-board by his side, on which he reared in his mind's eye forms and proportions suggested by it and emanating from it; he disposed the arrangement so as not only to meet the requirements, but also so as to produce a happy result in point of effect. In short, the two things went together; they were mentally indivisible, and must be elaborated, not without reference to one another, but in unity. Hence experience demonstrated that a good plan would generally be found to produce a good elevation: they were integral parts of a whole; the one having been artistically studied with a view to the other, the result would be harmonious.

None but those who had made a real study of planning had any conception of the infinite breadth and variety of the field of design which it created. They only knew experimentally the charm of puzzling over difficulties; of revising, rearranging, and redisposing, in order to overcome them; thereby probably creating other difficulties, which in their turn had to be surmounted by a rather similar process, and so on, until, after many disappointments, many failures and many inventions, a satisfactory result was at length reached. It was now many years since he resolved never to let a plan leave his hands until satisfied that it was right; and in battling with the difficulties thereby created until they had been successfully obviated, he had found some of the most engaging studies of professional life. The question with them should never be, whether a plan was good enough—that was an unworthy standard—but rather, was it the best that they could design? The former, the "it-will-do-well-enough" standard, prevailed far too commonly; the latter was the only standard really worth working for, because the only one which would lead to attainments beyond mediocrity. Said the PRESIDENT, "Never, then, rest content with a plan until you are satisfied that it meets "and fulfils all the requirements of the case, in the best and most complete "manner that you can think of; the plan is the foundation of the whole "design, and I need not say to architectural students, that if the foundation "be faulty, there is not much hope for the superstructure."

It might seem like insisting on an elementary truism to say that the plan of a building must necessarily be adapted to, and governed by, the exigencies of the site; but the not infrequent violation, or rather neglect, of so obvious a principle justified him in emphasising its importance. The peculiarities of a site in respect to levels and aspect frequently constituted difficulties that at first sight appeared insurmountable, but out of which emanated in skilful hands the happiest results, which otherwise might not have been thought of or attained. Herein was displayed the skill of the artist: to lay hold on all such adventitious circumstances and hindrances, and conform them to his will, transforming obstacles into mediums for achieving success. The neglect of such opportunities was unpardonable, and betrayed the bungler.

Prospect, again, constituted an important factor in planning. When the right aspect presented the best views, the case was simple; but that was often not the case, and few conditions called for more ingenuity than when the proper aspect was at variance with the prospect that it was desirable to secure. In towns, indeed, aspect and prospect must necessarily, and to a great extent, be subordinated to immovable conditions; but in the country it was different. While, therefore, striving for comfort, convenience, and grace within, they should never neglect an opportunity of securing the inestimable attraction of a higher than any art loveliness, the prospect of nature and creation. In connection with prospect, Mr. Macvicar Anderson condemned a practice too much in vogue: the glazing of the upper portions of windows with tinted, stained, or painted glass, sometimes uglier than anything it was intended to obscure from view. Situated as they were in London, the expedient was no doubt attended with advantages, shutting out hideous objects which one's neighbours were so fond of obtruding, or excluding the impertinent gaze of the too curious; but in the country, where it was frequently adopted, what possible justification could be urged? Nothing could compensate for the light of the sun, the beauties of nature, or the marvels of the heavens.

A plan to be good must be simple. No doubt the arrangement of some buildings was necessarily more elaborate than that of others; but they might take it as an unerring guide, that when one found a plan becoming complicated and confused, one was on the wrong tack. A painter, after hours of work, would sometimes wipe from his canvas all he had painted, and then make a fresh start with manifest advantage; so, when planning resulted in complication, one's best course was ruthlessly to obliterate, and begin *de novo*. Nothing compensated for the absence of simplicity in a plan.

Again, a plan was only good when it was the embodiment of thrift. Much had been said, and more had been written, on the moral aspect of thrift; and it would be easy to enlarge on the advantages of its application, not merely to the life, but also to the artistic work, of the student of architecture. Without thrift, both of space and material, a plan could not properly fulfil its purpose. Thrift was not parsimony, any more than liberality was waste. Each space in a plan, be it room, hall, stair, or passage, should be just the size that was necessary for its purpose; if less, there was parsimony, for what was inadequate would have to be enlarged hereafter at much more than what would have been the original cost; if more, there was waste, for it had involved the expenditure of more capital than was required, and would incur needless labour and consequent cost in maintenance. Take as an illustration a room designed on a scale beyond the necessities of its occupants; it was obvious that it had cost more to build and furnish than it should have done, and involved a perpetual cost for maintenance and service which should have been avoided. Hence, the happy medium was to be found in thrift. So in respect to materials: walls should be of sufficient thickness, floors and roofs of sufficient strength for their respective functions, not much more, and not much less; else there would ensue, either waste in the first instance, or parsimony, which would involve waste in the long run. There were, however, cases in which materials should not be too sparingly employed: in a mansion, for example, intended to be a family home, and to pass from generation to generation, it would be unwise, and out of keeping with its purpose, to apply too literally such a condition as that; for nothing imparted more dignity and a greater idea of the enduring purpose for which such an edifice was designed than massive walls, thicker no doubt than might be actually required for sound construction, but not more than was called for in order to be in harmony with the traditions and associations which the structure represented. That, however, was but one of those exceptions that proved the rule of thrift which he enforced. Said the President, "I am, of course, not unprepared for "the inevitable protest of the art-student, who in a burst of æsthetic enthusiasm "will denounce the suggestion that so prosaic a quality as thrift should dare "to enter the hallowed sanctuary of the art studio; but while entertaining "much sympathy with the enthusiasm of youth, and by no means desiring to "curb it, and while respecting opinions which I doubt not are perfectly "genuine, I venture to think that it would be easy to demonstrate that it "would be in the true interest of art were her portals more frequently and "more hospitably thrown open for the admission and entertainment of the

"prosaic maiden I have introduced to your notice. How often for instance "might she, with manifest advantage, restrain the artist hand in scattering "with inartistic profusion ornament which is misplaced, and therefore "ineffective! But to enter on such matters would be to deal with other "branches of the architect's studies, and be foreign to my present purpose."

Conditions more or less obvious existed, each one of which contributed in its place to the merit of a plan. Apart from considerations of aspect, prospect, and dimensions, each place should be—not only convenient in itself—but in its proper position in relation to other places; the work of an establishment, as well as the cost, might be materially diminished or increased, according as that condition was observed or neglected. Doors, windows, fireplaces, should be arranged so as at once to promote comfort and convenience, without needlessly destroying wall-space, or incurring draughts; the amount of window-space should be regulated according to the aspect; and many other considerations of a similar nature should be duly thought of. In short, the perfect plan was, and could only be, the result of the thoughtful study of each principle and every detail: none were too minute to be overlooked: as little things sweeten life, so attention to little details made a plan complete.

"I have written to little purpose," added the President, "if I have not "convinced you that planning is one of the most important, difficult, and "artistic studies of the architect. Now let me inquire why it is that plans "are so frequently bad. I am aware that there are men in the profession "who are adepts in planning, and whose productions in this respect we "admire. But are they the majority? Rather, I fear, will they be found to "be the small minority. Rarely do I examine published plans without detect-"ing faults which are obviously not the necessary outcome of the circum-"stances. Why is this? In the majority of cases it does not, I believe, arise "from lack of ability on the part of the author, but from the neglect to apply "the ability he possesses to the working out of a good plan. Where plans "are bad, they are so from two causes. (1) It is impossible to produce a "satisfactory result without practical knowledge of the requirements: in the "case of a gentleman's house, for example, how can we expect to succeed "without being familiar with the nature and working of the establishment? "(2) Plans are bad because they are not studied as they should be: I am "satisfied that there are many practising architects who have never realised "the true nobility of planning, who have never experienced the fascination of "the almost exhaustless field it presents for the display of imaginative artistic

"skill, and who consequently have concentrated their artistic powers in the "design of the elevation. Need I guard myself from possible misconception "by adding that not one word I have written is intended to militate against the "importance of artistic design as applied to the elevation? My subject is "Planning, and my remarks naturally apply specially to it. Moreover, "architects are not likely to regard the design of the elevation as the least "artistic portion of their work, and it is because I entertain the conviction, "judging from results, that they do far too much regard the design of the "plan in that light, that I have emphasised its artistic character."

The architecture of the future would derive its character, and find its development, from the students of to-day. The PRESIDENT was thus tempted to embrace the opportunity of bringing specially before students the subject of Planning, believing that those who undervalued it did so because they had not studied it and tasted its fascination, and in the conviction that there was no more useful as well as artistic study in which they could engage. The subject vitally affected those who were devoting their lives to the study of architecture, and their treatment of it would still more vitally affect those for whom, by-and-by, they might be called on to design; nothing would so certainly secure for them grateful blessings as to promote the comfort, convenience, and beauty of their homes, for on nothing did the daily happiness of civilised society so greatly depend.

THE PRESENTATION OF THE ROYAL GOLD MEDAL took place on Monday, the 27th June 1892, when the PRESIDENT delivered an Address * which treated principally of the long career of M. CÉSAR DALY, *Hon. Corr. Member*, as an architect and a man of letters in connection with architecture. Mr. MACVICAR ANDERSON said that it was an appropriate and a happy custom that the last Meeting of the Session should each year be devoted to the recognition of conspicuous merit and ability in connection with their Art. At the preceding Meetings of the Session they had been engaged in receiving information from specialists competent to communicate it, on one

* The Address, in its entirety, is printed in *The R.I.B.A. Journal*, Vol. VIII. pp. 357–365.

or other of the varied subjects of interest relating to architecture. But that night they occupied more purely unselfish ground. They did not receive. It was their privilege to give; and although the gift was not their own, for it was conferred by HER MAJESTY THE QUEEN, yet the responsibility attaching to it was theirs, inasmuch as they were graciously permitted to recommend to HER MAJESTY in each year the most fitting recipient of so high an honour.

For forty-four years that distinction had been bestowed by their beloved Sovereign, whose prolonged and beneficent reign formed the brightest and most lustrous page in English History; and he ventured to think that on recalling the names of those eminent men which constitute the roll of Gold Medallists of the Royal Institute of British Architects, even their illustrious *confrère* whom they were met to honour would deem it no ordinary distinction that his name should be added to such a list.

In the responsible exercise of their privilege they had for the last three years recommended to HER MAJESTY the names of Englishmen, whose high attainments they were thus proud to acknowledge. But it was one of the happy features characteristic of the Royal Gift, that in their recommendation they recognised no merely local, or metropolitan, or even national, limit. The sphere of selection was as unrestricted as that of Art itself—it was the wide world. Wherever merit was conspicuous, were it amid the nationalities of the Old, or the republics of the New World, it was their ambition to recognise and honour it. That consideration materially added to the value of the honour. Were Gold Medallists selected from among British architects only, the distinction, no doubt, would still be great of being one of a small band chosen by their colleagues for outstanding merit; but it would be as nothing in comparison with what it was, when the field of selection embraced the peoples and the tongues of the whole earth.

They had this year recommended to THE QUEEN the name of one who was a veteran in the world of Art, a giant when measured by the products of his pen, one whom they were proud to honour as a distinguished Frenchman, M. CÉSAR DALY.

Times there had been when their brilliant neighbours across the Channel were rivals in more serious avocations than those associated with the arts of Peace. Let them rejoice that their rivalries and contests were now confined to prosecuting such unwarlike pursuits as tend to advance the civilisation of the world. They welcomed their distinguished colleague as one who had thus nobly laboured. Few would leave so worthy a record of a long life unsparingly devoted to the advancement of Art. Few indeed could point to

such monuments of literary research as were embodied in the pages of the *Revue générale de l'Architecture et des travaux publics.* Few had found time and energy to publish such a series of important architectural works as *Motifs historiques d'Architecture et de Sculpture d'ornement*, *L'Architecture privée au XIX^e^ siècle*, *L'Architecture funéraire contemporaine*, *Mobilier d'Églises*, *Cours de Constructions*, and others of less importance, to say nothing of the numerous *brochures* and more fugitive essays which had emanated from his prolific imagination.

With M. César Daly's permission, the President referred to a few personal reminiscences, because in a career so active and so varied they could not fail to be of general interest. Born in France in 1811, he was brought at an early age to England, where he was educated, remaining till he was fifteen years old, having commenced the study of drawing in his eighth year. Returning to France in 1826, he attended classes at the College of Douai; at sixteen he joined the preparatory section of the École Polytechnique, and at seventeen carried off the first prize for drawing. His desire to join the army having been frustrated, he entered the office of M. Mallet, an architect at Douai, continuing at the same time the study of higher mathematics with M. Avignon, professor at the École Polytechnique. He was nearly twenty when, on the advice of his two masters, Mallet and Avignon, he left Douai for Paris, and entered the studio of Duban. He there acquired a somewhat exceptional position. French architects of that period neglected the study of mathematics, and evinced but little taste for travelling in their own country. Young Daly, on the contrary, lost no opportunity of utilising those means for the acquisition of knowledge. He took notes of all that he met with in his provincial tours that appeared to him to possess architectural interest, and the influence of such studies of old work was soon apparent in his compositions, which drew forth the congratulations of Duban, who, though a revered and respected master, honoured Daly by treating him more as a companion than a pupil. Labrouste also showed him great kindness; and when, in 1839, the *Revue générale de l'Architecture*, which had at length reached its fifty-second year of circulation, was established, it was Labrouste who designed the frontispiece.

In 1843 M. César Daly was appointed diocesan architect of Alby, and fulfilled the duties of that office for twenty-five years, during which he carried out the restoration of the Cathedral of Alby.

M. César Daly was the first, in 1848, to found a society for decorative or industrial artists engaged in designing for trade manufacturers, and he

insisted on their admission to the societies representing the Fine Arts. "The "society of the future," he said, "will be essentially industrial. Beware of "turning aside public sympathy by disdaining those who would embellish "trade with the attractions of Art. Let Art, on the contrary, penetrate every-"where, become a necessity, and be responsible, in the widest possible sense, "for all distinction and dignity." In the same year he organised a meeting of architects, painters, sculptors, poets, and critics, in order to elect and send to the Constituent Assembly a representative whose special province it would be, in all circumstances, to protect the interests of Art. The assembled artists, however, could not agree, each department refusing to the others any claim to the title. Narrow-minded jealousy and deplorable ignorance rendered united action impossible, and M. Daly had to be content with recommending each section to meet independently and appoint delegates to represent the Arts. At the meeting of architects he himself was elected, and they might rejoice that, having no wish to bury himself in a political assembly, he did not accept the nomination, preferring the freer life of traveller, student, architect, and journalist, from which the world had derived such great advantage. He was also an original member of the Council of Architecture, founded by ministerial decree in 1848, for the purpose of examining and approving the design and construction of ecclesiastical buildings, for which a grant was required from Government.

M. César Daly represented architecture on the Mexican Commission established by Napoleon III. during the Mexican War, in which that monarch sought to unite the most eminent savants of the time. In 1869 he visited Jerusalem for the purpose of exploration, and during his residence there was able to afford valuable assistance to the officers of the English Palestine Exploration Fund, at that time engaged in prosecuting their investigations.

In consequence of his constant journeys and the engrossing nature of his literary and archæological pursuits, M. César Daly was compelled, at a comparatively early period in life, to renounce private practice, and to restrict his attention to works confided to him by Government. In the course of his journeys he travelled over the whole of Europe (with the exception of Russia), as well as in Turkey, Asia Minor, Syria, Palestine, Egypt, and the north of Africa, studying monuments and recording notes, most of which were still unedited. He spent three years in America. Travelling, in search of archæological remains, through the United States, Mexico, and Central America, he was the first to note, in 1856, the ruins of several pre-Columbian cities in Central America, which until then had been almost ignored.

The President concluded his address with the following sentences, in the course of which he invested M. Daly with the Medal:—"M. César Daly, "congratulating you, as I now do most heartily, on having produced so "many works of literary merit tending to promote or facilitate the knowledge "of architecture, and on having been the recipient of so many honours, "deservedly conferred on you in the course of your exceptionally active "career, I yet am encouraged to hope that this Gold Medal, which it is "my high privilege as President of the Royal Institute of British Architects to "present to you, although the latest, will not be the least highly esteemed by "you of those honours which you possess, seeing that it is conferred by "Her most Gracious Majesty the Queen, on the unanimous recommendation of "those who are the best able to judge of your merits as author and architect. "Honoured Colleague, although you are one of the few now living who have "been witnesses of most of the stirring events which have made this century "famous, I yet indulge the earnest hope that it may please God to spare you "still for some years of useful activity, and that thus the world of art and of "letters may not be deprived of the advantage which it has hitherto enjoyed, "of so unique and so illustrious an embodiment of indomitable industry, ripe "experience, universal knowledge, and unquenchable energy."

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LXXXIX.

MODERN BUILDING IN EGYPT.

By Mr. H. Favarger.

Mr. J. Macvicar Anderson, *President*, in the Chair.

Mr. President and Gentlemen,—

THERE are some among you who may not have visited Egypt, but there are certainly none who have not heard of the Pyramids. It is a common but erroneous belief that there are but two or three in Egypt, though there are about forty now visible, dotted at intervals along the Desert on the western side of the Nile; but the two larger pyramids near Cairo lay the first claim to the traveller's curiosity. Their enormous size, the great interest that they inspire from their age and mystery, together with the ease with which they can be reached at present, ensure their being visited by every traveller to Egypt. They are known as the Pyramids of Gizeh, and form a group of eleven Pyramids which stand about eight miles from Cairo.

A few years ago, as some may remember, the energetic visitor had to get on a donkey, and, in order to stand under the shadow of the Pyramids, he had to make a day of it, bringing his luncheon with him, for nothing could be found in the sandy desert around him. To-day things are different. When the Suez Canal was opened, the lavish Ismail ordered, amongst other works that were to add to the grandeur of his reception of the Empress Eugénie, that a road should be made to the Pyramids, and that near them two houses should be built, one on each side of the road, in which to receive his guest with due dignity. This was done, one house being built on the platform of rock that forms the base of the Pyramid, the other on lower ground, to the north of the monuments and of the road. The former is still retained by his Highness the present Khedive. The small house on the lower ground was bought by an English capitalist, and forms the central point around which have been grouped the various buildings of the hotel called "Mena House." The conditions for its erection were not as favourable as might at first sight appear, for although stone, lime, water, and sand were obtainable on the spot, all other materials, such as timber, iron, cement, bricks, &c., had to be brought from Cairo, and in many cases imported from abroad.

The first care was to collect a stock of stone. Due permission was obtained, under certain conditions, to utilise the broken stones that are to be found loose and in considerable quantities around the Pyramids. These stones, detached from the sides of the Pyramids from time immemorial by the effect of the weather or by the hands of ruthless natives, form, on each face of the Pyramids, huge heaps of rubble, which hide the real base of the monuments and extend to a considerable height up the sides. During the last century it has been the object of the authorities and of antiquarians to remove as much as possible of this rubble, so as to clear the foot of the Pyramids ; but funds were seldom to be found for this enormous task, unless there was a specific object in making a clearance at any one spot.

An offer was made to the authorities which served the excellent purpose of allowing them, without expense, to proceed to the clearance of the Pyramids. After the work had been proceeding for a few months, some erroneous statements found their way into English newspapers. The theory developed and commented upon was, that the Pyramids were being stripped of their casing so as to enable a hotel to be built in the Desert ; and I hope you will allow me to digress slightly from my subject, and take this opportunity of explaining to you what actually took place.

When it was originally intended to use the limestone rubble from the Pyramids, an application was made to the Minister of Public Works for Egypt, who referred the matter to the Museum authorities, under whose direct control all the old Egyptian monuments are placed. The latter absolutely refused to allow a single workman near the Pyramids, but added, that if the necessary funds were placed at their disposal, they would employ their own men to clear away the rubble from certain points that had an interest for them, and that after the rubble had been searched, for inscriptions, &c., certain portions of it might then be taken away. This arrangement gave absolute security that not only would the monuments not be tampered with, but that any stone of interest would be secured at once by the Museum authorities. The transport of the rejected rubble was made partly on carts, but mostly by the native method, in rough rope nets slung over camels.

Mena House Hotel.

The main consideration in adding seriously to the house was to decide what aspect it should take. Most houses in Egypt are built with a view to being as cool as possible ; the walls are thick, and the best rooms are invariably exposed to the north wind. But at Mena House other considerations had to be weighed. The visitors, for whom the house was more especially built, are often invalids, whose principal object in coming to the East is to secure as much sunshine as they possibly can. It was therefore decided that the additions should be made at right angles to the old building, and that their southern face should become the main frontage of the building.

A wide open space separates the hotel from the road, and serves as a drive to the main steps. Passing under a large wooden verandah, the visitor reaches the entrance, and steps into an antechamber built of *mushrabia,* and glazed to keep out draughts,

and thence into the hall. This room consists of an open space 33 feet square rising through the three storeys of the house. On the first floor a balcony gives access to the bed-rooms, and higher still a large cornice leads up to the skylight.

As the hall was intended to be a feature of the house, and to be used especially as a lounge, the staircase was placed some distance off. The drawing-room facing east, and the library facing south, occupy the principal part of the ground floor of the main frontage block [fig. 1].

To the westward of this block, the Desert, rising with a slope of about 1 in 7, gave a good position for the staircase, which is placed so as to serve, with its alternate landings, the several floors, first to the east and then to the west. To the westward, again, of the main staircase minor half-flights of stairs, at a distance of about 40 feet from one another, lead one upwards to the bed-rooms. In this way an easy ascent, with rests on the flat along the corridors, was obtained for invalids.

A passage giving access to the inner courtyard is provided under the first landing

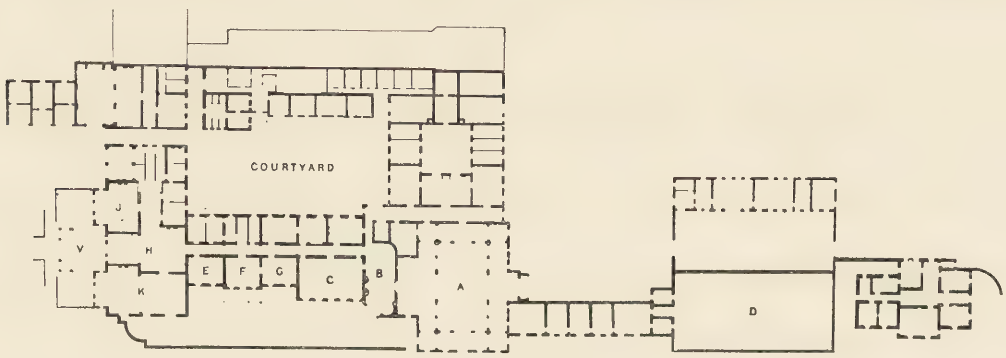

Fig. 1.—Ground Plan of Mena House Hotel, Pyramids, near Cairo.
(Scale of about 130 feet to one inch.)
A, Dining-room. B, Vestibule to dining-room. C, Breakfast-room. D, Swimming bath E, F, G, Private rooms. H, Main entrance hall. J, Library, K, Drawing-room. V, Grand vestibule.

of the main staircase. To the westward of this passage, and as it were in the cellars of the block adjoining it, were placed the gentlemen's lavatory and baths.

The billiard-room was built outside the house and connected to the card-room by arches in the main wall. In this way the billiard-room receives its light from above, and there is sufficient to brighten the card-room under the main house through the arches. To get the necessary height for the billiard-room, the floor had to be sunk several feet below the level of the sand. This entailed a series of steps down into the card-room, and again down to the billiard-room. This arrangement gives, with the arches, a picturesqueness to the room which is not without its charm.

On the north side of the main staircase service-rooms of half the height of a floor are provided, and are reached by a wooden staircase running in half-flights. The bath-rooms for the whole house run in tiers above the main lavatory, so that all the heating apparatus could be placed in the yard, and close to the service and bath-rooms.

When the question of closets was discussed, it was decided that Moule's earth system should be used in preference to the water system; and in order to prevent the

inevitable smell from entering the house, a separate block was built in the yard, which contains nothing but closets. On each floor, opening out of the lavatory, is a bridge which leads to these closets, and so facilitates their isolation from the house. The sides of these bridges are of open *mushrabia* work,* provision being made in the cold weather to glaze certain portions of it, leaving sufficient openings for perfect ventilation. " Mushrabia " is the name given to a peculiar wooden tracery work made by Arabs, consisting of little turned ovals of wood fitting one into the other by pegs left at their longer ends. It is made up in a variety of designs, and is most effective when placed on a window and seen from the inside with the sky behind it. It was originally used as a screen for the harem windows, for, although it enables the occupants of the room to see outside, they are protected from the gaze of passers by.

The bed-rooms are divided into tiers of three, each tier being half a flight higher than its neighbour. The three rooms of each tier open on the common corridor, and communicate with each other by a pair of small doors placed back to back, so as to secure privacy in each room. Throughout this part of the building it was decided to adopt for the bed-rooms our English single-leaf door, instead of the French double door, which dwarfs the room and lacks the sense of comfort which our small English doors give. The reception rooms, of course, being large and lofty, required larger doors, and these were arranged in double panels with suitable pilasters and architraves. Every room has, wherever practicable, an English open fireplace. To mention this may seem absurd, but a fireplace is, although a necessity in this country, such an unknown luxury, and is so entirely absent in most other buildings, that in Mena House it forms quite a feature. The windows are of plate-glass, suitable shutters and frames, covered with mosquito wire netting, being provided to meet the requirements of the country. The flooring of the bed-rooms is all of narrow Swedish boards, but the hall, the lower passages, and the billiard-room are paved with marble ; and it was thought advisable to lay down a solid oak parquet floor in the library and the drawing-room. The main staircase is of marble, the landing slabs being carried on iron girders.

When the design of the dining-room was being considered, it was thought advisable to adapt the Eastern Saracenic architecture to our modern requirements. The room was to be a feature that would be an attraction to visitors, and it had also to be " expanding," if such a word may be used—that is to say, that while providing, with a sense of comfort, accommodation for say eighty to a hundred persons, it would have elasticity enough to seat 250 visitors if necessary. To fulfil these conditions it was decided to give the hall two levels, and to make, as it were, two rooms, one inside the other—or, in other words, to surround the main room with a raised arcade which could be left unoccupied without appearing empty, or could be utilised when necessary for an increased number of guests. Four principal arches form special features of

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* The " meshrebeeyeh " windows have been described by several contributors to the TRANSACTIONS, notably by Mr. J. D. Crace in the volume for 1869–70, p. 80; and again by him and Mr. R. Phené Spiers, F.S.A. in Vol. VI. N.S., pp. 228–241, in their description of " The Arab House in Egypt."

the main or inner room, and on each side of these large openings two smaller arches continue the arcade [fig. 2]. Up to the springing of all the arches the piers are built of Tura limestone, and above that the arches are turned of brick, whilst the wall above is plastered. On the west side, above the large arch, a band stand is provided, with approach from the roof. Over the minor arches, panels for the reception of Arab

Fig. 2.—The Dining-room of the Hotel: Corner under the Raised Arcade.
(From a photograph.)

inscriptions are left, and over these small windows fitted with mushrabia. Above all, and going all round the central room, is a space of about 3 feet, with a chain pattern in plaster above and below it, which is again intended to be filled up with Arabic inscriptions. From this springs the cornice, which carries the eye to the ceiling of the room at the height of 33 feet from the floor.

At each corner of the raised arcade around the room are placed minor arches, which are real where they support the roof, and false, that is to say, recessed, where

they come on the outer walls. In each of these recessed arches a window is provided, and for some time it was difficult to think of something that would have the utility of a window and yet not be a plain oblong opening. At last a plan was hit upon. The old Egyptians had always admired the effect of strength and security which was given by a solid stone lintel over their openings in tombs and buildings, and we find that in the later and more decorative periods the Saracenic architects invariably tried to accentuate this lintel by taking round it various mouldings by which they decorated their openings. With this leading idea, and by a process of thought that it would be impossible to analyse, it was decided to replace the solid lintel over the windows by a void, the indication of the lintel being given by the termination of the opening at the top of the oblong window, while the feeling of support is given by small arches in the open space over the window. The actual opening under the false lintel is filled in, to about three-fifths of its height, with two plate-glass windows made to open with vertical hinges. The remaining space is occupied by a fixed sheet of plain glass and a mushrabia panel. It is doubtful if such a window would be adapted to any other style of architecture but Saracenic, which at every turn gives one the impression of this exaggerated lintel.

The entrance door to the room is taken from an old Arab sebyl in the Rue Darb-el-Gamamys. It follows the traditional Arab idea of a lofty archway filled in, leaving only a small doorway, over which a window is provided. Apparently the original purpose of this upper opening was to light the passage or hall to which the door gives access. A ram's-horn pattern accentuates the archway, both on its face and underside, and the whole is enclosed by a further moulding, which again, stretching on each side of the arch, gives the impression of a lintel broader than the opening.

The vestibule side of the entrance door is treated in the same manner, but with a different pattern. The door itself—in fact, all the doors of the dining-room, are original old Arab doors. They are truly surprising pieces of work, and show not only a high appreciation of design, but also a sound knowledge of the principles that should guide any person using wood in a hot country, where this material is apt to split, shrink, and warp. The framework is of stout red pine, while the whole of the panel which forms the door consists of small pieces of wood fitted together without a nail, and all having play enough to shrink or swell. Should the outer framework be removed, the whole panel falls to pieces, and it would take a great deal of patience to put it together again.

At the eastern end of the dining-room, and projecting into the road at the level of the floor, a balcony is built on corbels of true Arab type. These corbels or brackets consist of two projecting stones, on which are placed in succession three wooden beams, each piece projecting beyond the part below it. A slight and decreasing incline upwards is given to each part, the floor joists being placed horizontally from the outward point of the last projecting beam to the wall. This divergence of the lines in the Arab corbel gives a peculiar impression of strength. The various parts of the corbel, both stone and wood, are held together inside the wall by an iron strap, and from this strap iron ties carry back the strain through the floor to the inner row of columns, so that the corbel becomes a real cantilever. The sides of the balcony are made up of old pieces

of mushrabia, while its roof is attached to the wall like a bracket, and made self-supporting, so as to lessen the weight on the corbels.

The vestibule to the room is about 20 feet by 40 feet. At one end, one corner is left square, the other is rounded off as a hollow quadrant; at the other end a large mushrabia balcony window gives light to the whole room. An Arab dome lantern is placed in a line with the entrance door, and breaks up the monotony of the ceiling.

The whole of the walls of the dining-room is covered with rough mortar plaster; and, with a little distemper, the architectural lines of the building are accentuated, the columns and arches being divided into the appearance of stone courses, alternately grey and red.

The kitchens by the side of the dining-room, and sundry tiers of offices and bedrooms rising on the slope of the hill to the west of the central courtyard, complete the square of buildings which form the main house.

The foundations of the building gave but little difficulty. Although wet sand is a proverbially treacherous material to build upon, dry sand forms a basis which is almost equal in resistance to solid rock, provided that it cannot move laterally. It is a well known fact that pressure applied to sand vertically is promptly translated into a lateral effort. It follows from this, that if the sand upon which a heavy weight is placed, such for instance as the walls of a house, is held laterally, it will form an absolutely firm basis.

The elevation of the building is noticeable only for its simplicity. The intermittent way in which it was built prevented a uniform design being prepared, and each successive addition had to be placed to suit the position of previous blocks. The frontage is of rubble ashlar, while the other portions of the building are plastered.

Looking at the work as a whole, there are many things that it would have been better to have done, and many others that might with advantage have been omitted. The whole building must be looked upon more as the result of a race against time, varied by a scrimmage with constant difficulties, than as the embodiment of carefully digested plans. The hearty co-operation of those connected with the building operations contributed in no small measure to the final result. Mr. Chapman was a sound counsellor and a reliable friend, always ready, when matters were troublesome, to give a cheering word. The able manner in which he superintended the financial department, and the care with which he saw to the due delivery of the various materials, made the calculation of the cost of the various buildings a simple matter. Mr. Brugger made a most able clerk of the works, and his careful Continental education, combined with his knowledge of the country and of the Arabs, rendered his assistance most valuable to me. Mr. Andrew Ramsay executed most of the drawings and tracings, and showed a care in all details that was very pleasing. Messrs. Sciplini, Vassallo, and Dreyfus were each of much assistance in their several departments, while the various European foremen on the work cannot be spoken of too highly. Taken as a body of men, they were willing and cheerful; and although they were working under circumstances of heat that were occasionally very trying, there was never a word of complaint from them.

Notwithstanding the occasional high temperatures, the health of every one was good throughout the three years' work, and accidents were fortunately few. One Soudanese labourer had a leg broken through a mass of hard sand falling on him, and two or three children fell small heights from the scaffolding, but in all cases the patients recovered quickly and are now well.

Your indulgence is begged for the shortcomings or obscureness of this Paper, and it is hoped that you will look upon it more as a series of notes taken from impressions at various times than as an attempt at a literary production. Much has been said in it that may be of little or no interest; in fact, the only reason for a record of the work having been written at all, is that it was executed in the Desert, where at every turn substitutes had to be thought of to replace skilled labour and modern appliances.

Construction of a Well in the Desert.

During the progress of the building operations a matter of hardly less importance claimed serious attention. It was that of the water supply, which was then bad and limited, and totally inadequate to the wants of this new hotel.

During high Nile, water was plentiful enough, and, although muddy, could be filtered and made palatable, but in the dry season the only water obtainable was from a "sakkia," or Arab surface well, which received the infiltration water from the Nile. This source of supply was variable and bad, the water being generally so full of animal matter that it had to be filtered, then boiled, and once more filtered before it could be drunk with safety. This was an operation feasible only in a private house, where time and care could be given to the matter, but in a hotel, with Arab servants, it became an almost impossible task. To the Arab, water is water, whether clean or dirty, and he never can understand why Europeans should be so averse to drinking the muddy water which he generally prefers. After careful examination of the question, and bearing in mind the fact that water flows easily through gravelly sand, and can only percolate through the stiff alluvial soil of the Delta, it appeared likely that, as the infiltration water reached a point where the soil ended and sand began, it would find an easier flow northwards, towards the sea, in the gravel. Thus, arrested by the soil on the one side and by the rock of the desert on the other, it was likely to have formed some underground river running at a certain distance between the hills of the desert and the cultivated land. On the other hand, whatever moisture was collected on the Desert would seek to find its way to the level of the Delta; it would be arrested by the alluvial soil, and turned northwards towards the sea.

Whether either or both of these theories be correct it is very difficult to say, but in any case the fact is now proved that water can be found on the edge of the Desert in large quantities and of great purity at this particular spot, and it is highly probable that in other places where the same conditions occur water would be just as easily found. These various considerations made it advisable in the interests of those concerned to sink a few trial borings, and ascertain at once if there was any foundation for such theories. Moreover, the increasing requirements of the building and of the hotel

made it imperative, in the event of the trials being unsuccessful, to establish an expensive and complicated system of filters to remedy the bad condition of the water.

A few old boring points were found in Cairo fit for the work proposed. With some lengths of old gas-tubing, and a rough clamp to seize the pipe and act as an anvil to receive the blows of the hammer, a primitive boring tube was constructed. The driving apparatus consisted of a large wooden trestle, with a pulley suspended from the centre and a rope running through it, fixed at one end to the driving hammer (an old shaft coupling kindly lent me by a friend), and having at the other a few stout Arabs to act as the lifting power. A spot was selected about 200 yards from the hill and 300 from the cultivated soil, where there seemed a likelihood of finding the imaginary river. Experience proved, however, that the position was too near the hills, for after going down about 23 feet, the tube struck the rock, and refused to go farther. A little water came up, probably from infiltration, but not sufficient to pump. Some 80 metres farther on to the valley another trial was made, the tube being sunk at the bottom of a dried-up pond that had become lined with alluvial soil. The water came fairly fast on reaching a depth of about 33 feet, but, owing to the boring tube being lined with brass wire gauze, the water had a disagreeable metallic taste, which rendered it unfit for drinking purposes.

A fact, however, occurred which was the turning point in these experiments. Although the Nile was at its lowest, the water rose in the tube to within a foot of the level of ground in the dried pond, and this was equivalent to being about 6 feet from the level of the soil. A source of supply had, therefore, been hit upon which was entirely independent of the level of the Nile, and which apparently took its rise higher up the valley, or was the result of the drainage of the Desert. Further, the fact of the well being artesian, that is to say, rising in the tube to the level of the soil, at once admitted the possibility of establishing the necessary pumping apparatus on the ground, and of dispensing with expensive deep well pumps.

The result of this second boring determined a third trial in a place to the north of the road, and on a spot that would be more convenient for establishing a pumping station. Again the same primitive plant was used, and care was taken to substitute horsehair for brass wire gauze on the boring point as a means of keeping the sand out of the tube. At 39 feet down an abundant supply of pure brilliant water was obtained, but on driving the tube 6 feet lower, it came to rock, and refused to go deeper. The water ceased to come up with freedom, so that the tube was withdrawn to its former position of 39 feet deep. A lift and force pump with $1\frac{1}{2}$-inch plunger was attached, and for several days drove the water in a $1\frac{1}{4}$-inch pipe to a tank which was placed near the building. The supply was absolutely continuous, and the water of great purity. At first, as was to be expected, the water came up charged with small particles of sand of a greyish-yellow colour. But on careful examination it was found that the sand contained about 25 per cent. of a grey clay closely resembling the potters' clay that is found in some parts of Egypt. From this the inference was drawn that the great purity of the water was due to the lower stream being protected from all surface

infiltration by this mixture of clay and sand, and that if the end of the tube happened to be below this layer of sandy clay, the suction of the well would probably form a pocket or chamber.

The existence of water of good quality having been proved, there merely remained the question of obtaining a sufficiently large supply. This, however, required additional plant for boring and pumping, and after consultation with the owner of the property it was decided to bring out from England a larger boring plant and a steam pump. In the end of September 1889, two 3-inch tubes, by Messrs. Norton and Sutcliffe, were driven close to the third boring.

A Worthington steam pump was connected by a 3-inch pipe to one of the tube wells, and had a delivery pipe of $2\frac{1}{2}$ inches, leading to the swimming bath and to a main supply tank placed on a hill at the back of the building at an altitude of 120 feet above the level of the pump. The engine worked satisfactorily from the first, but refused to go at full speed. When full steam was put on, it raced and would not pump; at half speed matters went smoothly. A vacuum gauge placed on the suction tube soon showed that, however kind Dame Nature had been in supplying a moderate amount of water, she refused to be pressed unless a bigger area for the ingress of the water was provided. It was then evident that there was water in quantity, but that the admission holes of a 3-inch tube were insufficient to supply the requirements of the pump, and a project for sinking a well was mooted and discussed.

It was not until a rather serious but natural accident occurred that the absolute necessity of a well was clearly shown, if anything like an abundant supply of water was to be depended on. One day the cap of the suction tube of the pump was removed to examine the depth of the water, and closed again with care. Shortly afterwards the engineer in charge of the pump reported that it was delivering sand and water. Apparently the ceiling of the chamber formed at the foot of the tube had fallen in, bringing with it sand and clay, and so disturbing the whole of the water in the pocket. The next day a 1-inch steam pipe from the boiler was placed down the tube, and a quantity of sand and water was blown out of it, but this increased the evil, for a column of sand about 4 feet in diameter sank all round the tube, apparently going down to fill the pocket and replace the sand that was being blown out. The brass plungers and the barrels of the Worthington pump were of course ruined, and nothing remained but to draw the house-supply by hand-power from the other tubes.

The necessity for a well having been proved, a design was prepared which consisted of a 13-inch brick wall built on a circular iron curb of 8 feet internal and 10 feet external diameter. This curb can be best described as a circular trough, V-shaped in section, the outer side of the V being vertical. Filled with concrete, it formed a basis on which to build the masonry, whilst its cutting edge allowed it to run down as soon as the sand from the inside was removed. To give the well rigidity in case it left the perpendicular before it was quite hard, six rods of 2-inch by half-inch iron were bolted vertically to the curb. These ran through the masonry, and had holes left at their upper ends to bolt on further lengths. Subsequent experience showed the advisability

of this precaution, especially in wells which have to be sunk in sand. The slightest check which the cylinder receives at its base, through coming in contact with a stone of any dimension, causes the sand to slide down on the outer surface of the well and find its way under the curb. This displacement of sand from one side of the exterior of the well naturally causes it to cant over as soon as the stone that temporarily supports and impedes it is removed, and it is important to have rigidity in the masonry, so as to prop up the well and keep it in its vertical position. The well was constructed in annular sections of about 10 feet.

A grab and winch were used to withdraw the sand from the inside of the well; and as each section was built on, the weight forced the tube down as the sand was taken

Fig. 3.—Construction of a Well in the Desert.
(From a photograph.)

out. The work of removing the sand with the grab had to be done under water, for no pumps were available of sufficient capacity to keep down the water.

Fig. 3 is a view of the well with a load on it of about 30 tons. Fig. 4 is a section showing the curb and masonry and the suction tube; half plans of it are given in fig. 5. The iron braces built into the masonry are shown in figs. 6 and 7. The following is a daily record of the progress of the work:—

May 21, 1889.—Selected suitable spot for the well, about 22 metres from the engine house, and had a hole dug in the sand about 16 metres in diameter and 2·50 metres deep, until sand, moistened by inundation water, was reached.

May 26.—Placed curb in position, and having bolted to it the vertical ties, filled it with a concrete

consisting of one part of English Portland cement, two of sand, five of flints. The sill of the door of the engine house was chosen as a bench mark, and the levels mentioned here were all taken from this spot, which about represented the mean ground level around the well. The curb was placed 10 feet below the bench mark.

May 27.—Began building the well with best bricks obtainable, laid in a mortar of two sand and one cement. Thickness 13 inches, or one brick and a half.

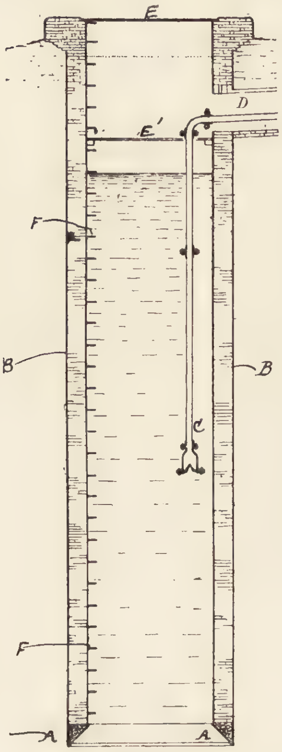

FIG. 4.—SECTION OF THE WELL.

A, A, Curb. B, B, Brickwork. C, C, Suction tube. D, Channel for tube. E, E[1], Upper and lower lids. F, F, Iron rungs.

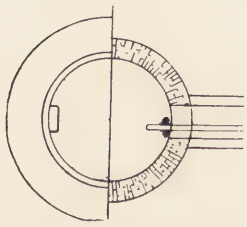

FIG. 5.—PLAN.

Half at E; half at level of suction tube.

May 28.—At 1 metre above curb stopped building, and rendered brickwork inside and out. First coat, two sand, one cement; second coat, put on whilst first was moist, of pure cement, worked down smooth.

May 29.—Sank the well 72 centimetres by lifting sand over the sides into the hole around.

May 30 *to June* 1.—Built on 2 metres more of masonry, rendering it out and in as before.

June 2.—Again sank well by hand-removal of sand. At 3 metres 85 centimetres below sill came to infiltration water.

June 3–6.—Built on 2 metres 60 centimetres of masonry as before, having lengthened the six iron stays in the masonry.

June 7.—Prepared platform on the top of the well, by placing across the masonry four beams 10 inches by 12 inches and about 16 feet long, and then at right angles to these a floor of smaller beams, the whole being so arranged as to leave a square aperture in the middle of about 3 feet by 2 feet 6 inches. Over this opening arranged the trestles, so that the grab would just fall through the open space. On the floor of the platform placed rows of barrels, which were afterwards filled with sand, giving total weight of about 4 tons, exclusive of the weight of the well.

June 9.—Began working with grab in the morning and sank well 43 centimetres.

June 10.—Continued, and sank well 53 centimetres.

June 11.— Do. do. 31 centimetres.

June 12.— Do. do. 6 centimetres.

The result of this last day's work led me to think that the weight of the well was insufficient to overcome the side grip of the sand, so added 50 bags of sand, weighing 3 tons, and about 2 tons of iron rails, making in all 9 tons [fig 3].

June 13.—Resumed work, sank 30 centimetres.

June 14.—Continued work, sank 16 centimetres.

June 15.—Off day.

June 16.—Sank well 12 centimetres, trestle broke down.

June 17.—Mending trestle, resumed work and sank 13 centimetres.

June 18.—Sank 35 centimetres.

June 19.—Sank 29 centimetres.

June 20.—Sank 10 centimetres in the forenoon with difficulty. The curb had apparently reached a gravelly stratum, and the grab brought up next to nothing; the smallest pebble getting caught between the jaws of the grab, held it partially open, and before it came to the surface of the water nearly all the sand had run out. Moreover, found that the sand was running down on the outside of the well in one spot, and that this had made the well lean over 10 centimetres out of the perpendicular. Too little of the masonry was then visible to get a purchase on it so as to straighten it. Decided to build up again. To enable the well to withstand the strain, added six vertical bars of about 4 metres each. The top ends were all connected by horizontal ties, and from the top of each bar took two diagonal stays, one on each side, down to the starting point of its neighbour. This gave a sort of skeleton drum which was built into the masonry [fig. 6]. The completion of this work was delayed until the 17th of July.

July 18.—Began rebuilding platform with timber, and replaced the iron rails and the barrels and sacks of sand.

July 22.—Work had hardly commenced when the shaft of the winch broke. Wrote to the Barrage for another one. With this delay and with the Bairam holidays intervening, work had to be left until the 6th of August. In the meantime, placed a prop from the top of the well to the sand below at an angle of 45°. At the top end it was firmly chained to the top of one of the iron rods that were built in the well, while the lower end rested on a firm basis on the sand. (As the well descended this prop was bound to push the well back into its position or break it off short. The latter contingency was not a likely one, seeing the amount of staying the well received.)

August 6.—Began working again with fresh trestle and winch, and with a grab with toothed opening, so as to work into the hard gravel. Sank 25½ centimetres.

August 7.—Sank 32 centimetres.

August 8.—Worked only part of the day and sank 5½ centimetres, the rest of the day being employed loading up 25 tons of pig-iron.

August 9.—Sank 21 centimetres.

August 10.—Off day.

August 11.—Sank 21½ centimetres, and noticed the well had been forced back plumb by the prop, which was then removed.

August 12.—Sank 20 centimetres, but sent to Cairo to engage a native diver. Hoped by sending him to the bottom of the well to loosen the gravel around the curb that it might hasten descent of the well. Also gave the outside of the masonry a smear of tallow and blacklead, so as to give the sand less hold on it.

August 13.—Diver came and did good work. From that day to the 31st of the month the well sank quickly and evenly a total of 5 metres 31 centimetres, an average of over 24 centimetres for every working day. The diver did good service, occasionally bringing up stones weighing upwards of 30 lbs. which, had they been left under the curb, might have caused much trouble.

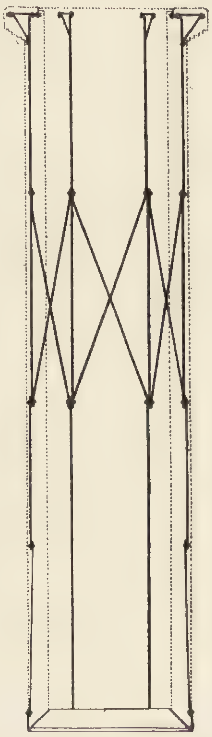

Fig. 6.—Section showing Arrangement of Iron Ties.

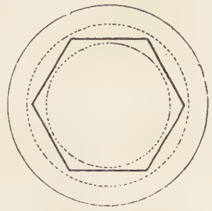

Fig. 7.—Plan.

The well had by this time sunk with its load to the level of the hole in the sand, so that, as the bottom of the well curb had reached the exact spot required, nothing remained but to build up the masonry and fill back the sand.

When the masonry had reached the level of the ground, it was raised a further 3 feet, with the last courses projecting outwards so as to form a rim. The object of this was to give the well a bearing on the surrounding soil so as to prevent its sinking any further. A few days after it had been completed, the well settled about 6 inches, but since then, having apparently reached its bearings, it has made no perceptible movement downwards.

When the well was completed, two wooden coverings were put to it with the object of keeping out light, sand, and heat. The one was placed at the very top of the well, the other about 8 feet down. This second covering served as a platform upon which the work of laying the tubes from the engine house could be conveniently done. About 2 feet above the lower platform a masonry channel 2 feet by 1 foot 6 inches runs at a slope up to the engine house and holds the various suction tubes.

When the Worthington pump starts on its work, the level of the water in the well falls rapidly at first and then more slowly, until it gets about 6 feet from its original level. There it remains stationary, and proves that the supply is practically inexhaustible. The greatest amount of water pumped from the well has been about 100 tons a day, the effect being merely to lower the level as described above. The ends of the suction tubes are placed about halfway down the well, so that they are always certain of being immersed in water, and they are too far from the bottom of the well to make any disturbance of the sand. Some time after the well had been in use a quantitative analysis was made by the chemists of the Khedivial Laboratory, and their report was very satisfactory.

Ordinary Building.

A few words may not be out of place as to the various kinds of building in Egypt, and as to the materials and the labour that are available. Modern buildings in the East may be roughly classed under three heads: 1. Mud brick huts; 2. Stone and mud houses; 3. Rubble ashlar buildings.

1. Mud brick huts are almost exclusively found in country towns and villages. They are constructed of mud bricks dried in the sun, the binding material being also mud. This style of work is done with as little moisture as possible, and makes a warm, comfortable house. The settlement is considerable but even, and if due provision is made for it, does not interfere with its stability. To harden and bind it, the mud used for the bricks is mixed with either sand or chopped straw, called by the natives "tibn." These bricks are about 3½ by 5 by 10 inches, but occasionally much larger sizes are made. It is usual for the natives in the villages to cover in these huts with a roof made of date palm leaves, over which is spread a layer of mud of about 8 to 10 inches thick. This is found to be sufficient to throw off, or rather absorb, the occasional showers of Egypt. The floor is generally beaten-down mud, whilst doors and windows are of the roughest description.

2. Houses are often built by the richer natives of stone and brick rubbish, the binding material being mud with a certain proportion of lime mixed with it in some cases. These are often carried two storeys high, the joists used being split palm trunks, and the floors made of flags of soft limestone about 2 inches thick and about 1 ft. 6 in. square. The roofs are usually flat, and covered with stone and mortar.

3. Almost all the modern buildings in Cairo are built of rubble ashlar. The great quantity of limestone found in Egypt, and the ease with which it can be worked, make it a cheaper material than a harder stone or than bricks. At intervals of about two feet it is advisable to lay a round of bricks, to level up the work and to equalise the pressure.

Materials.—Of the various qualities of limestone used in Egypt, that most in favour is supplied by the quarries of Tura, about ten miles south of Cairo; it is the

centre of a convict establishment, and a great deal of the quarrying is done by the prisoners. The Tura stone is white, of good texture, and is an easy stone to work. The Mokattan Hills behind the Citadel supply a yellower stone, which, although it can be obtained in fairly regular size blocks, is apt to become soft. There are other kinds of stone of closer texture, which are very useful for foundations, especially in places exposed to water. But the expense of these harder blocks generally prevents their being much used unless in exceptional cases.

Lime is usually well made in this country. The kiln is circular, built of stone and mud, the fuel being the dried stalks of the dhurra plant, or Indian corn. It is supplied by a door at the bottom of the kiln, and the natives sit up night and day to feed in this rapidly consuming fuel. Of late years, since the gasworks of Cairo have been established, coke has been obtainable. Dhurra grass was the first fuel used at Mena House for lime-burning, but the natives established a ring and tried to run up the price. This decided the use of coke, and ever since the first trial it has been used as the cheaper and more convenient fuel. The lime is taken out of the kiln and slaked at once, being turned over several times until it is quite cool. It is then screened and stacked ready for use. For building it can be used at once, but for plastering the walls it is better to leave it for a month or two before use. This prevents the wall from the "starring" that the small particles of unslaked lime produce.

Of sand there is no lack in Egypt, and it is found in endless varieties of size and colour. The grey desert sand is the most useful, and is to be the most easily found.

Burnt bricks can be obtained fairly cheaply, and of late distinct efforts have been made to improve their quality.

The ordinary brick is generally made by natives under the guidance of Greeks or Levantines, but a better kind is now made by an enterprising German firm, the ordinary bricks being worth 10*s.* to 16*s.* per thousand, whilst they can command 20*s.* to 24*s.* delivered in Cairo. They are smaller bricks than those used in England, and measure about 2 by 4 by 8¼ inches.

Timber is imported from Sweden, Turkey, and from Trieste. The Swedish wood is a good yellow pine, and is used chiefly for floors, doors, windows, and woodwork generally. The timber for joists and rafters is cheaper and comes from the Adriatic. It is roughly squared in sizes from 4 inches by 4 to 12 inches by 12, and sometimes 16 inches by 16, with corresponding length. The smaller timber is used by the Arabs as joists in its original square state, but a great economy can be effected by using bigger timber and giving it one or two vertical cuts.

Iron girders are imported from England, and are of good quality. All the smaller fittings of a house, such as stoves, ironmongery, varnish, paint, sanitary fittings, &c., are obtainable in Cairo, but at Mena House they were all imported direct from England. Marble comes from Sicily, and is fairly good.

Cement is all imported, the only really reliable qualities coming from English makers. It is not an uncommon trick to paste false English labels on the ends of casks containing inferior French cement and palm it off on the unsuspecting as

English cement. It is a high compliment to our makers, but this hardly counterbalances the expense and annoyance of having to condemn carefully executed work.

Labour.—The workmen in Egypt are almost entirely Arabs, directed principally by European foremen. It is a curious thing that, although Greek, Italian, Maltese, Turkish, Levantine, French and German artisans were employed, not a single English craftsman offered his services at Mena House. Much could be said about this fact, and it seems strange, when in England there appears to be such overcrowding in the labour market. Among the Arabs a few clever and intelligent masons and carpenters are to be met with, but the majority of them are indolent, ignorant men, with whom it is extremely difficult to deal. As regards rough labour, the Arab, properly supervised, is not unsuitable, although his creed is to do as little work as possible and to take as much time over it as he can. The children, both girls and boys, are extremely quick and strong, and in proportion to their size do a great deal more work than their elders. In some cases, where large quantities of sand had to be removed, a portable railway was tried, but it was found that for distances under one hundred yards it was cheaper to employ manual labour. The sand or earth is carried by the children and labourers in mat baskets holding about twenty to twenty-five pounds, and it is an extremely interesting sight to see a string of children, with their baskets poised on their heads, walking springily along, encouraged by the wild shouts of their native driver. On occasions when visitors are looking on, the driver generally exhibits his anxiety to further the interests of his master by an apparently furious use of a cane wand which he always carries, but there is little really severe use made of this forcible inducement. Of plumbers there is a sad lack in Egypt, and the Maltese who did the work had almost to be taught the use of his tools. Blacksmiths and engineers are fairly intelligent, and are generally Italians or Germans.

The pay of the Arabs is high, considering that a man can support himself and a family on from sixpence to a shilling per day, his own food costing about a penny to twopence. The children receive per day 4*d.* to 6*d.*; the labourers 6*d.* to 10*d.*; young carpenters, masons, and painters 1*s.* to 2*s.*; the skilled masons, carpenters, and painters 2*s.* 6*d.* to 3*s.*; a few really good artisans 3*s.* 6*d.* to 5*s.*

The only work at which the Arab excels is at the turning required to make up mushrabia. At this he is very quick and produces excellent results. The work is done almost on the ground, the lathe consisting of two centres, between which are fixed the wood to be turned and a heavy square bar of steel that forms a continuous rest. The wood has a reciprocating motion given to it by a bow held in the right hand, while the chisel is worked by the left hand, and guided by the toes of the operator. The close attention to the small work seems to affect the eyesight of the turners, and it is rare to see any but boys and young men doing this sort of work. A gouge for roughing down the wood and an inch chisel are about the only tools they use for the rough as well as the finest work.

H. Favarger.

XC.

SCULPTURE AND SCULPTORS' METHODS IN RELATION TO ARCHITECTURE. By JOHN BELCHER, *Member of Council*; Mr. W. S. FRITH; and Mr. T. STIRLING LEE.

Mr. J. Macvicar Anderson, *President*, in the Chair.

MR. PRESIDENT AND GENTLEMEN,—

ARCHITECTURE and sculpture appeal to similar emotions, for each deals primarily with *form*. A building of imposing mass and stately outline may in its sternness and solemnity impress us powerfully and seriously, but when to it is added, in fitting proportion, the poetry and grace of sculpture and the subtle charms of colour, it will excite still higher and stronger emotions. For architecture has this advantage over her sister arts, that she can bring them into such union that the most perfect achievement can be attained by their joint action; but it is obvious that the closest tie of all exists between architecture and sculpture.

We may admit, then, as an abstract proposition, that our work will gain in value and force when it is associated with sculpture. But how is this to be done? The opportunities are so rare, that when they occur we hardly know how to take advantage of them. In this grinding, mercenary age, when clients expect so much for their money, such an extravagance as sculpture seems out of the question—a luxury which the mere utilitarian aspect of a building will not allow. Then, if we may just whisper it, we hear that sculptors are so unreasonable, and their work so costly! We are thus face to face with an initial difficulty. No doubt there have been faults on both sides, and these can only be rectified by a little closer intercourse between architects and the sculptors, who, I am sure, will meet us half way. One remedy, I believe, is to associate the sculptor with ourselves early in the work; he should not be left to manipulate sundry blocks reserved for carving towards the completion of the building. His work should not be regarded only as a means of obtaining variety of texture on the surface of a front, or as a means of obtaining variety of sky-line, or a counterbalance to defects in design. Such ignominious ends are not the

proper use of sculpture. Whereas if the sculptor be taken early into consultation he will be able, if he rightly appreciate architectural completeness, to give expression to the purpose and object of the building, to emphasise its character, and animate it with life and beauty. When it thus becomes an integral part of the whole design, clients (whether individuals or committees) are more likely to value its significance and importance. If left to be added later on—if funds permit—and treated as an "Applied Art," it is sure to be omitted on motives of economy, and eventually forgotten.

Is there not lurking too often in the client's mind the idea that sculpture means the perpetuation of the form of an individual who has laid himself open to this kind of recognition of his deserts? Yet sculpture has a higher function than the production of effigies; its power should be felt in allegorical expression of great ideas, and in the illustration of noble deeds. It is this power—quite apart from mere statues in niches where sculpture takes an independent position and is merely framed—which I think we should invoke to bring out or make clear and intelligible the object of our building. In friezes, panels, pediments, entrance-doorways, what wide range there is for the sculptor's art! If we cannot have quantity, let us be content with quality. Our buildings would gain in dignity and beauty if, instead of being covered from top to bottom with meretricious ornament or meaningless enrichments, the interest were concentrated on a few square feet of real sculptor's work, after the manner of certain old Spanish buildings and Genoese palaces, where the carving is centred in the entrance-doorway, which itself is placed in a broad field of plain wall-surface.

I by no means wish to imply that a building should be considered as a mere background for the display of sculpture, but only as illustrating the value which concentrated ornament and plain wall-space have in relation to each other. It is absolutely essential when sculpture is allied with architecture that it should be subordinate. It should assist by hinting at the purpose or history of the building, or concentrate attention on its dominant motive, fulfilling perhaps some actual duty in place of the ordinary geometrical form, as done by caryatides. Moreover, it is not necessary that it should be of that highly finished character which is requisite in "pedestal work," which corresponds with the "easel work" of the painter; but, like "fresco work" in the same art, it should be broader in treatment while possessing similar artistic qualities. Pure and simple outline is desirable in work of this character, for, just as melody in music, this is able to reach and touch the heart. Contours, therefore, should be carefully weighed and easily understood. There is an impression that where we have little sunshine all modelling should be in high relief; but the effect of cutting up and fretting away, in small and trivial parts, every inch of surface is only to increase the gloom. Coarse and bulbous work is invariably rendered more hideous by its capacity for holding and retaining the sooty particles of the atmosphere. High relief, it is true, may be used for masses, but a plain surface catches and holds the light. In such a climate as ours, the aim should be to reflect and make the most of the light, rather than to multiply and deepen

shadows. Large mouldings and coarse carving do not necessarily impress or give grandeur in effect; but with the aid of sculpture, the effect of largeness of scale can be obtained, for the human figure furnishes the eye with an accustomed scale for comparison. Sculptured figures, therefore, require careful adjustment to the building, because if exaggerated they will reduce its apparent size. When introduced into a frieze, they should be considered and treated as a continuous band encircling the building. To obtain this effect it must have a geometric treatment similar to the equestrian frieze of the Parthenon, which possesses a poetic rhythm in the arrangement of the heads, bodies, and legs so peculiarly suitable to the lines of a frieze. There is a rectangular character in the forms of the Parthenon frieze which is in harmony with the rectangular style of architecture.

JOHN BELCHER.

MR. PRESIDENT AND GENTLEMEN,—

THE present subject for discussion does not, as I understand it, directly necessitate reference to our old friend the question as to "whether sculpture should "be used in architecture at all"; but as questions bearing upon this point are sure to arise wherever the artistic side of architecture is under consideration, it may be as well to say that "I take the propriety of the combination for granted," content with the fact that the sum of effect as presented to us, in all the great periods of architecture, always contains as one ingredient "sculpture." With so great a mass of examples, so varied in style and treatment, as that which the labours of our predecessors place before us it is difficult to deal, except each set may be considered as the working out of a particular theme, each and all subject to general principles of harmony.

It must be remembered that we are dealing with but one phase of sculpture, which in the abstract means the study and production of whatever is beautiful or interesting in living nature, and which can be appropriately produced in the solid: to cultivate the faculty of form, and in so doing to enlarge knowledge and the field of right enjoyment by exciting and gratifying the love of the beautiful in form or in combinations of forms.

While, however, in the abstract, sculpture is distinct from architecture, in practice all sculpture but that of a fragmentary or gallery order is brought into intimate contact with it. In the case of statues the pedestal which there represents architecture should, no doubt, be designed to harmonise with the statue, not the statue with the pedestal; in monuments architecture bears out and co-operates in producing the impressiveness required, harmonises the sculpture with the surrounding objects, or divides from them as may be necessary. While in these architecture

conforms to the sculptural motive, it is necessary, in any large structure, that the sculpture should conform to the architectural motive, its office there being to bear out the scheme of light and shade; to give contrast and value to mouldings, as mouldings do to wall-surfaces; to give required emphasis, and to properly envelop the constructive scheme; to assist in illustrating the purpose, and generally to contribute to the impressiveness and beauty, of the building.

To effect this object the sculptor must develop his scheme from the architectural base, his work must be firmly rooted in and grow from the architecture, and must not be independent sculpture imposed on architecture. That his ideas are beautiful is not sufficient; they must be fitting. An independent work having no limiting space to occupy may project in any direction the artist pleases, may be of whatever general shape and however irregular, so long as it expresses what is intended, and is sufficiently beautiful to justify production. Applied to architecture it has to fill, and properly fill, a prescribed space, and look unconstrained there; it can only have the amount of relief and space arranged for, and must within this limit fulfil its functions, as an integral part of one whole.

In gallery sculpture the eye can select the distance and position it finds most enjoyable, while in architectonic sculpture the work must be executed to please the eye at prescribed distances and elevations, where no change of position available to the observer can substantially change the operations of the optical laws ruling the appearance of objects at a distance.

Take some instances of this. Small cuttings making facets of black and white, seen from a distance, have much the effect of cross-hatching in drawing, the light and dark being blended by the distance, and assuming a grey colour in proportion to the amount of shadow contained in the cuttings; while planes, little differing in intensity when near the eye, at a distance gather effect, growing in distinctness. Rounded forms have a tendency to appear heavy and shapeless, and dark cuttings appear to diminish in size. An arm extended against the sky appears thinner than it actually is, while the body of a figure so placed has a tendency to look thicker than it really is. These questions are ruled by the laws as to the size which can be most conveniently seen and the foreshortening caused by position, together with the influence of atmosphere. Generally, the distance has a tendency to round over lights and shadows so that neither appear to have the full degree of angular effect they possess when near the eye.

The foreshortening caused by elevation is a difficult matter to deal with, especially as the eye is extremely sensitive as to the vertical plane. The old Gothic sculptors,* in their seated figures, show a clear knowledge of foreshortening; these are carved in an almost standing position, the thighs being short and at an obtuse angle to the body and legs, instead of being at right angles, for a figure having that position is likely, if placed at a height, to appear to have its head growing from between its knees.

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* See Viollet-Le-Duc's *Dictionnaire*, art. "Sculpture," pp. 162–164; and other portions of the same article.

The affinity of masonry to carving and sculpture is, I am afraid, in these days somewhat overlooked, yet masoned mouldings must necessarily be produced by carving, though with the help of straight-edge and moulds. I venture to think, however, the time frequently arrives when these implements were better taken away and the mason taught to use his *eyes*, since it is mainly to gratify the eye he cuts at all. An instance of this came to my notice at a church in Gloucestershire, in an original Early-English corbel, entirely of masonry, which was delightful in effect, and expressed the most delicate perception of form and light and shade; while its fellow, restored under comparatively modern direction by the mechanical mason, was devoid of all interest. The series of Italian chimney-pieces in the South Kensington Museum are extremely interesting from the fact that the mouldings are either left from the tool or rubbed with a small piece of grit, which leaves a certain amount of undulation of surface, mouldings and carving being apparently worked together.

It is interesting to note between masonry and the simpler forms of carving, and thence to the most elaborate and the highest sculpture, the series of links graduating from severe restraint to complete freedom, in which masonry deals with the actual structure as ruled by the laws of gravitation, but is carried forward into the working out of the structure required, not for physical reasons, but to gratify that æsthetic requirement of seeing and feeling a beautiful and expressive structure, which is the distinctive reason for the existence of the art of architecture as distinct from mere building or engineering. In performing its functions, masonry begins the scheme of light and shade, but with forms severely restrained, and more or less geometrical in character, not imitative of living nature—while carving carries on the scheme by the use of forms founded on, or imitative of living nature, until the point is reached where figure sculpture may carry the work beyond the merely decorative, and may jewel it with the highest imaginative production of which the art is capable.

With reference to the decorative factors, the weaving of the sculpture into the structure so that one feels it to be a necessary portion of the whole is probably the first requirement; next to which, and contributing to this end, is the question of the scale of light and shade—which is determined by the size and intensity of the various planes of light and shade presented by the carving. Unless these are of the right artistic value, chording with the scale of masonry used in the structure, architectonic effect is lost and discord produced; the masonry and the carving scales are quarrelling instead of being helpful to each other, and here is the special point upon which the greater number of mistakes are made. The mechanic lets this happen as it will; the artist deals with it as a matter of the first importance, and finds means to secure harmony.

It is by means of these planes of light and shade that form is presented to the eye, and design appears in rhythmical sequence of line and mass; and by "design" the fund of knowledge of things and thoughts beautiful with which the mind of the artist is stored is brought forth. The cultivation of this fund and power of expression renders the abstract study of sculpture in its highest form as vitally necessary to

the architectonic as to the gallery phase of the art, for it is not fitting that in this, in which the highest thought has found expression, it should stammer in utterance. New, beautiful, and fitting combinations, sets of forms and treatments sympathetic with architecture, should be evolved. It is of the utmost importance that this production of fresh work should be promoted. In ornament much has been done recently by architects, many of whom have devoted much time and ability to producing fresh designs for carving. I have in mind a series of most beautiful drawings, quite fresh, designed on the basis of Perpendicular work; I cannot but think, however, that the place to design is in the actual material, if we are to have really competent sculpture. For since artists work by feeling, that simply copied (not designed) must lack the spontaneity which stamps the work of art. In this, as in all other art work, the value depends on it being individual, and on the wisdom shown in application to the purpose to be served.

The production of this with the present increased means of obtaining knowledge should surely be possible. The difficulty appears to be to arrive at the proper payment for design; it being obviously more simple to take some example executed a few hundred years ago than to undertake the production of fresh work. The risk is also stated as an unanswerable argument, but whether there be great risk or none depends on whether the sculptor employed is competent. The matter, however, rests entirely with architects, who alone are in a position to deal with it.

In going to nature for inspiration (the natural fountain-head for fresh ideas), there is a tendency to adopt what may be called the natural in a crude form, and it is questionable if there are many positions in which the direct and realistic representation—of natural foliage, for instance—is altogether satisfactory; even in swags of flowers and fruit some treatment is necessary, and then the work is rather overlaid *on* than belonging *to* the structure; while in figure-work the same considerations operate. In the case of niche figures, where there is the opportunity,—by treatment of niche and canopy,—of sufficiently isolating or connecting the effect, and in finial figures considerable freedom may be permitted, in both cases, of course, within certain limits. In panels, by putting the work properly in relief, there is always the opportunity of securing the right feeling of cohesion; but these being works complete in themselves, there is danger of the sculptor becoming so absorbed in their details as to forget that the panel belongs to the structure.

With the exception of the Renaissance and kindred styles, where large use is made of figure-work purely decorative, the leading motive of the great mass of figure-sculpture is of the nature of illustration, the making of permanent records of events or thoughts to instruct or remind, as in Egyptian and Assyrian, and in Gothic; while in Greek and Renaissance, and perhaps to a less perfect degree in Gothic, the working out of this is combined with that of pleasing the optical sense by so treating figures and obtaining light and shade effects as to powerfully contribute to the expression of a building. The cornice placed in the room that contains the Tomb of Mausolus at the British Museum gives some idea of what simple light and shade are capable of; how

the artistic handling of the units of construction so present the work that neither construction nor decoration is obtrusively assertive, but both combine in giving an expression of refined dignity.

The question of amount of treatment necessary is one upon which it is doubtful if any verbal statement could carry clear definition, depending, as it does, on situation, character of architecture, and subject; but all quite satisfactory work is in some way treated: the panel by Ghiberti in the font of Siena Cathedral is a beautiful example of treatment in the way in which the whole work is produced by planes large in proportion to the figures, but just sufficient to bring it into scale and harmony with the whole work. The treatment of the Parthenon sculpture is admirably disguised, but, slight as it appears, it is sufficient to secure the effect of indisputably belonging to the building; and in the metopes the treatment of form is carried out to make them look right from below. This, the grandest illustration of sculpture in relation to architecture, shows that it was executed with full knowledge of the requirements and beauties of both architecture and sculpture; it is the highest sculpture existing, and conformed to its position without apparent effort. There is no reason, except the want of knowledge, to prevent sculpture in the present day from equally contributing to the same beautiful result, and enjoying the same dignity, which the acceptance of this orderly liberty secured in the case of the Parthenon.

W. S. Frith.

Mr. President and Gentlemen,—

In accepting the invitation to read a Paper on sculptors' methods in relation to architecture, I feel that it is an indication, and a very practical one, that you, as a body of architects, are sincerely desirous of elevating sculpture to its proper position, and welcoming her home into the family of architecture. Although we have been standing at street corners and in open places, and with our backs to the windows, for many years, you will find us ever ready and willing to join you in making the mutual home beautiful. I was apprenticed to an architectural sculptor, so-called, in days I trust past, for I look for the time when the distinguishing epithet of "architectural sculptor" or "figure sculptor" will no longer exist, and that we shall all be able to enrich architecture and be, in the most complete sense of the word, sculptors.

What have we sculptors to do when an architect sends us a drawing, or has a conversation about work? No doubt the first question after having seen the design is, what will it cost to execute? If the work be worth doing, and the opportunity be one on which he can put forth his best efforts, you will find the young sculptor enthusiastic enough in his art to meet you, and it will not be the cost which will be a stumbling-block. Having touched upon this important point, the sculptor takes the

design home, there to walk up and down, thinking out the subject: what is the use and purpose of the building? He no longer turns over books and photographs, or consults museums for something that has been done before and will fit in, but works out his subject for himself. The sculptor of the present day is generally well trained; his artistic nature more or less developed, his faculty of taste, which can be one's only true guide, cultivated by the more intimate relations now existing between the arts, enable him to compose and be himself. If flowers or birds suggest themselves to him, with their beauty, meaning, and characteristics; or animals: his knowledge of the organic world gives him his subject—each having its own figurative language, speaking in its own symbolic tongue to all who can understand it; or, it may be, he selects the human figure, with all its attributes. Having worked out clearly what he wishes to tell the world of its beauty and thoughts, read in their outward and visible surroundings, he takes his pencil and paper, and composes the lines of his subject, considering and bearing in mind the architecture, so as to be in harmony with his fellow-workers—no envy or desire to outdo his brother-artist, but to feel that they are indeed one, for he knows that to be in keeping is the greatest gain to himself, and the best shrine for the work of his hands. How beautiful this study of line is, cannot, I think, be quite clearly understood without the most intimate knowledge and study of the human form, its continued and never-ending flow. So it is with everything in nature, but brought home most clearly in the study of man—from head to toe, from feet, legs, body, neck, head—no stopping, no hesitating, but one continuous rhythm, for he is the law of all things, "balance"; and as man is the most perfect illustration of this law, every line and form having its balancing line, so we study him as our highest ideal, taking him as our guide and principle of design, in order that our work may carry on the lines of the architecture, and be in balance with it.

The lines being settled on paper, he then makes a sketch model, with the surrounding mouldings run in plaster or built up in wood, for here he is brought to consider the most important point: that is, the study of light and shade, or effect, the neglect of which is the cause of most inharmonious work. It would take too long to go fully into the law of Optics, and I think you will forgive me if I say that few people know or understand what this is to a sculptor, for by it the sculpture of different countries has been governed, and has received its national characteristics, as shown in Egyptian art, completely mastered by the Greeks, and expressed in words by Plato in the dialogue of Minos, who writes: "What kind of power is the sight "with which we see things? It is that sense which through the eyes can reveal "colours to us." This explains why those sculptors who have studied painting have done most successful work, from the point of view of effect. The necessity of the study of effect was felt by our early masons, whose golden rule was that a mason should always work "to" a moulding, never "by"—that is, if worked "by," the result must be cold, mechanical, effectiveless; but "to," it will only be right when the effect of the light and shade of the moulding wanted is obtained. Respecting the question of the amount of shadow his work must carry, in order to be harmonious in

light and shade as well as line, you will at once see that the shadow cast by the mouldings, placed in a light as nearly as possible the same as the work will ultimately have when fixed, will give you the keynote for treatment. The height and depth of the relief, the cutting of the drapery, must be entirely governed and controlled by the mouldings: if too deep, the work will be black and spotty; if too flat, the effect will be thin and poor. So one feels how great and vital is the question of light and shade, and how essential must be a complete and true knowledge of the situation and light which the work will receive.

When the sketch is completed, it is as well, whenever possible, to place it in position, for at this stage any alteration can be made; and the sculptor thus obtains a complete grasp of what is requisite, which is of the greatest value, in his work.

We now come to the methods of execution and the materials to use—clay or plaster, drawings, or working direct in the stone from the sketch. Dealing with the subject now I must confine myself to stone; and, in considering this material for sculpture, suggest what method should be adopted when the latter is associated with architecture. The art is divided into two classes—the plastic or modelled, and the glyptic or carved. Treating stone, we have to do with the latter, so must consider the laws that govern that material. The subject being the human figure, and the material in which it is to be executed stone, we have two things to consider—the science of anatomy (the interior law of man) and the science of geometry (or the exterior law of our material). If influenced more by one than the other the result will be more realistic and less architectonic, or *vice versâ*; so, should it be worked entirely on the plastic laws, the result will be incongruous and out of keeping with architecture; so also, if the work be the result of masonic laws without much knowledge of the human figure, it will be primitive and lacking in form, though when placed on a building it will be far more satisfactory and harmonious than the realistic production. So, Gentlemen, I feel that, in spite of all our knowledge and wonderful technique, clay is dangerous when used for the preparation of stone. In relief-work I take paper and pencil, and draw my figures on the geometrical principle of planes, as if I were carving direct, for should one work on any other principle in carving, it would result very probably in a hopeless mess. I then trace the drawing on to the plaster, and carve my model. One thus works on true and scientific glyptic lines; the stone, pointed from the model, can then be taken up and finished.

You will understand me when I say that sculpture worked on this method and associated with architecture is but the highest form of masonry, and the perfection of the work will depend on the sculptor's knowledge of form and feeling contained in geometrical or architectonic planes.

I wish to say a few words on the selection of lines in drapery. I make a small figure, 3 ft. high, from life, giving the position and movement I want. If thin transparent drapery is wanted, I think Indian muslin the best; if thicker and heavier folds are required, fine flannel. The drapery is then arranged according to the composition; and, in the work I am thinking of now—the St. George's Hall Panels—the

perpendicular lines are those to select in order to be in keeping with the architecture, passing over, or but slightly suggesting, the transverse folds, except when the light and shade, or the carrying on of line from one figure to another, require them. I cannot go fully into this selection of drapery here, but no folds should ever be used without meaning: every fold should have its reason, and be executed with the most perfect intelligence.

In conclusion, Gentlemen, I have said that to study painting is of the greatest value to the sculptor in his knowledge of colour and effect, and I feel that the study of architecture is of the most vital importance to him if his work is to possess architectonic dignity and repose.

T. Stirling Lee.

ABSTRACT OF THE DISCUSSION.

Mr. GEORGE SIMONDS thought that there was very little doubt that the architects and the sculptors had pretty generally come to one conclusion, and that was that if they were to have once again any great period of art, it must be by a combination of the arts—that sculpture, painting, and architecture must not be like three horses newly put into an omnibus, all pulling in different directions—but that all must pull together with a long pull and a strong pull, and that in that way only would they arrive at anything very great in art. Of course they might go on building houses and churches without sculpture, and making statues and statuettes to be put up in galleries and public squares, without much assistance from architects, and painters could paint their easel-pieces and send them to the Academy, and so the world would wag on, but they would not do anything more than had been done before, certainly, and probably less. He was quite sure that the sculptors would be found willing to do the best they could to meet that awful question of price—and of course it was a most serious question; and he believed there were plenty of sculptors who were prepared to give study to architectural, or, as the lecturers properly called it, architectonic work. He thoroughly agreed with what Mr. Stirling Lee said, that the drawings should be worked to, not worked by; but in preparing the drawings for a sculptor to work to, it would be very well to remember that there were certain things which he cannot do. For instance, it would be impossible in working in stone or in plaster, or anything else, to produce an effect like that which was often given by drawing: he meant that often heads were not sculpturally, but realistically, treated; they were drawn as a painter would draw them, and one could not possibly produce that effect in sculpture. There were things of that kind which it was very necessary for an architect designing for a sculptor to remember. Of course he thoroughly agreed with what had been said as to making the drapery harmonise with the architecture, and leaving out anything

in the way of small or frivolous detail; every line should express something that required expression. Architectonic sculpture had a great advantage over what he might call cabinet sculpture: that in architecture one knew beforehand, or ought to know, exactly the conditions in which the sculpture was to be placed. It was to go at a certain height; there were certain points of view from which one could see it, and the light and shade would be of a certain quantity. Given those facts, the sculptor ought to be able to produce something finer in effect than any work that he might do which was to be exhibited in a gallery and eventually placed he knew not where.

Mr. H. H. STATHAM (*F.*) was afraid that he rose a little in the spirit, in some respects, of an unbeliever. Although he very much sympathised with what had been said in the three Papers, he was not sure that some of the theories which had been put forward in them were not carried a little too far. There was no doubt that for a long time past they had had practically three separate arts pulling three different ways, and that lately the relationship between them had been neglected; but there was rather a tendency now to speak as if none of the three arts had any power of standing alone, or could do anything without the others. He thought the assumption a mistake, and that it was unwise that an opinion of the kind should be entertained as pointing out the course for the architect of the future. In the first place, architecture had its own expression and its own poetry, independent of any assistance whatever from sculpture or painting. He did not say that sculpture or painting did not add materials of the highest value to it, but still it was an unfair position to put architecture in to say that it was necessarily incomplete without those sister arts. Then again, speaking now from the sculptor's point of view, the sculptors appeared disposed entirely to give up the idea that their own work was to be considered independently as what he heard called "pedestal statues." He quite agreed with all that Mr. Stirling Lee said as to the importance of considering sculpture in reference to its position in the building, which of course had been very much neglected, and as to its being desirable that the sculpture should appear as a part of the architectural design, and should be designed in reference to the mouldings; and the principle was laid down in one of the Papers in regard to foliage ornament—a principle which, of course, all architects had admitted for years past—that foliage ornament must be conventionalised into a quasi-architectural form. But he was surprised that the sculptors rather passed over what seemed to him to be the fact: that in doing that—in harmonising their sculpture with the building—they had necessarily to give up some of the life of their art. They could not get over that. Take the sculpture of the Parthenon frieze: that was very much conventionalised sculpture; it was, in fact, decorative. Take the sculpture in front of Wells Cathedral: that was magnificent in a decorative sense, but if one took the figures separately, they were manifestly somewhat deficient in life; they were architecturised into harmony with the architecture. Now a word for the pedestal statue, for he did not wish to see it cornered and put on one side. Dalou's monument to Delacroix, recently erected in Paris, was a group full of powerful movement—perhaps a little too much movement for sculpture; still, it was a very impressive and a very expressive

monument; and he could not see how one could make that at all architectural without taking some of the life out of it. It rather seemed to him that the sculptors were now inclined to go too much the other way, and to give up some of the life of their own art. Therefore he put in one plea for sculpture as a poetic art by itself, and for a little consideration for the "pedestal statue." He was afraid that he was posing as a terrible scoffer, but he was not sure whether they were not bowing down too blindly to the notion that the Greeks always arranged their sculpture exactly as it should be arranged. He thought the Parthenon frieze the finest piece of architectural sculpture in the world; but was it put in the right place? He had always had a feeling that it was not; one could not have seen that frieze well from the outside of the colonnade. One could stand inside the colonnade and look up at an acute angle to a very highly fore-shortened and low-relief sculpture, with a roof just over it shutting out the light from it. His impression had always been that that bas-relief was an extraordinary instance of the most beautiful sculpture being partially sacrificed by the place in which it was put; and it was perhaps an argument in support of the theory that the Greeks regarded that sculpture more in a decorative light than in a sculptural light. They regarded it, probably, as a band of architectural ornament; but as sculpture it must have been very much thrown away to the eye of the ordinary observer.

Mr. WOODWARD (*A.*) thought that architects themselves might help sculptors very much indeed in introducing sculpture not only into the mansions of the great, but into the mansions, he would say, of the middle class. The cost of sculpture, of course, was a great drawback; but if architects would only in designing their houses show their clients the most advantageous places in which to put the sculpture, and would also place before their clients at all events some approximate estimate of the cost of the sculpture, the richer client, or even the well-to-do middle-class client, instead of wasting his money, as he did at times, upon an oil painting which was never properly seen, might expend his money more advantageously in the use of sculpture.

Mr. WILLIAM YOUNG (*F.*) said that in the building which he had erected in Glasgow, £10,000 had been expended on over a hundred figures. But that sum did not represent the value of the amount of sculpture which had been executed, because it was done at so low a price, and so earnestly on the part of the sculptors acting with the architect, that if he had spent £40,000 over the work it would not represent the value of the sculpture placed there. He was convinced that if architects adopted sculpture in their buildings, they need fear no difficulties at the hands of the sculptors. It was curious that in that northern city there should be the largest display of sculpture in connection with an architectural work to be found anywhere in the country, and that the city of Glasgow, which was perhaps the most republican city in the kingdom, had, without grudging the cost, set an example of the application of sculpture to architecture. It had been asked, "How are we to do it?" As to that he found only one difficulty. There was no difficulty with the architect; there was no difficulty with the sculptor; the only difficulty was with the client who would not

provide the money. Architects looked to the County Councils, and bodies of that sort, or to the Government, to set the example of the application of sculpture to architecture; but how seldom did they find that the Government of their country gave assistance to architects and sculptors to combine the two arts? If sculpture was to be applied to a building it must be part and parcel of the design from the very beginning, and in the Glasgow building there was not a figure which was not in the original design; and in order that the thing should be easily worked out, he made the sculpture an illustrative story of the city for which he was working. In one longitudinal panel there were thirty or forty life-size figures. He started with the entrance doorway on the ground floor, the keystone of which had the Glasgow coat of arms and the motto, "Let Glasgow flourish," and that was the whole *motif*. He put that into the sculpture thus: Let Glasgow flourish by the aid of Virtue, Religion, and Knowledge. The two figures on one side of the shield represented Religion and the Virtues. On the other side Knowledge was represented by the arts of sculpture, architecture, painting, music, and oratory, and by the sciences of astronomy, geology, engineering, and so on. On the next floor he worked out the application by placing, in the spandrils in the centre of the top row, figures emblematical of the various trades and industries of Glasgow. Two of the panels were executed by the late John Mossman, a man who was never surpassed for the classical feeling which he threw into his figures, with very little work. The principle was to draw in clay; and in every instance in which a figure was executed, it was modelled full size and put up in its place. There was no other way of arriving at the effect which a figure would have when it was put into its place. If the figures were repeated two or three times in similar positions, then models one-third size were large enough, and could be pointed from quite as well. The next was a series of windows, with a band of sculpture filling in the spandrils, &c., to a continuous length of 250 feet long, broken up by the columns and pilasters. The figures represented the various trades and industries of Glasgow. Then over that came the detached figures representing the presiding deities, such as Piety, Peace, Plenty, and Health. The top of all, the pediment, was to illustrate the distribution of their works. Now, the pediment happened to be executed in the Jubilee year, and he thought he would put in the Jubilee of Queen Victoria if given another £1,500 towards it; and it was given enthusiastically, while one gentleman regretted that it had not been asked for in bronze or marble instead of in stone. Accordingly the top pediment represented Queen Victoria seated on the throne, with her subjects coming from the four quarters of the globe. The figures on the left-hand side represented Canada and the West, and those on the right-hand side represented India and the East coming and doing homage to Her Majesty. One of the most charming figures was designed by Lawson, and was something like the figure of Liberty enlightening the world in New York harbour. But it was Truth illuminating the city, accompanied by Riches and Honour. Coming back to the original theme: how were they to get sculpture in their buildings? The old-fashioned way was to talk about it, a second way was to think about it, and the third way was to do it. They must put sculpture

in their drawings, they must make it part of their designs, and they must insist on having it done.

Mr. CONRAD DRESSLER said a method of education which had gone out altogether, especially in sculpture, was the apprenticeship system. By it a tradition was followed out which enabled pupils to tread in the paths of their masters, and to start from the point where the latter left off. That they gained such great efficiency was, he thought, principally due to the fact that work came to them much more easily in consequence of that system. They ought all to consider whether it would not be a good thing to take into their studios young men and show them how they worked, so that in time, when they came to know their art, they could start on their own account.

Mr. A. BERESFORD PITE (*A.*) thought that it was only by the useful and free intercourse between sculptors and architects that the progress had been made which had been referred to that evening. It might be said that a few years ago, when the modern reredos was erected in St. Paul's Cathedral, public attention was first called to the matter. Whatever difference of opinion existed about that reredos perhaps need not be referred to, but there was one monument earlier than that in St. Paul's Cathedral, the work of a sculptor-architect—the Wellington Memorial—which in the best possible way, and in a manner that none of them could perhaps ever hope to see excelled in a generation or in a century, showed how with perfect freedom, and yet at the same time with perfect dignity and beauty, an accomplished sculptor could combine architecture with his forms, and an accomplished architect could combine sculpture with his orders and features. He hoped that the day would not be far distant when an effective public protest would be made against the undignified position that that monument occupied. The true combination between architecture and sculpture, as exemplified there, was completely lost by its present position. In what direction were they to look for another Alfred Stevens? Were they to look for him among the ranks of architects or among the ranks of sculptors? He thought that if some of the sculptors present who sacrificed, as they would undoubtedly sacrifice, emolument for the sake of assisting architecture, were to take up architecture in combination with their sculpture, the day might come when they would have architect and sculptor combined in one, and perhaps then another Alfred Stevens, or even a Michelangelo, might be produced.

Mr. R. PHENÉ SPIERS, F.S.A. (*F.*) said that their brethren abroad were more fortunate in having their buildings graced with sculpture than they were, because it had always been recognised by foreign Governments that art was a luxury which must be paid for by grants from the State. The foreign Governments had always recognised that the arts, such as painting, sculpture, architecture, music, and others, must be subsidised in some way if a really high standard was to be attained; and they had recognised that in subsidising those several arts they were not only adding to the grandeur and history of their own country, but were really educating their own children. He feared that the non-recognition of that principle by the Government in England was one of the chief causes of the neglect which had been so much felt. A

great deal was to be said for the advantage which, certainly in France, was found by the students of the three arts studying together in the same school. Meeting there continually in the *École des Beaux-Arts* (where, of course, nearly all Frenchmen studied, because those who obtained prizes in the provincial towns were sent up to Paris to continue their studies), they were able to exert much influence one on the other, so that at an early stage in their architectural or other studies they did not consider that architecture could stand alone, but that it was necessary to add the two complements of painting and sculpture. Those who obtained the highest prize, the *Grand Prix de Rome,* were sent to Rome for a period of four years—one sculptor, one painter, and one architect in each year. There they lived for four years, more or less, in the *Villa de Medicis,* being thus brought into the most friendly intercourse. Therefore, as the architects who obtained the *Grand Prix* were eventually entrusted with the more important public buildings in France, it naturally followed that in the course of their work they began by appealing for assistance to their old *camarades,* the sculptor and the painter, with whom they had so long been in contact in Rome. There was also a third reason, and it was to that he wished to draw special attention. He referred to the great necessity, for all architects, of figure-drawing. The late William Burges had never ceased to impress upon all architects the absolute importance of knowing how to draw the figure. The object he had in view was not only that the subtle nature of figure-drawing enabled one to draw all other ornament with greater facility, but because he thought that a building should never be deemed complete without the architect having conceived some kind of sculpture for it. In the examinations for admission to the French School of Architecture, the students were obliged to do that which had never been considered necessary in the case of any English architect: they had to send in and submit a drawing (two feet high) from the antique, showing that they had already some knowledge of figure-drawing. But in addition to that, in making the various designs in competition for the schools, the French students never hesitated to indicate in some way or another the figure-sculpture which they would like to see adorning their buildings; and it was a singular fact that the chief authority to which they referred, and on which they based their knowledge of decorative figure-drawing, was that of the English sculptor Flaxman. The illustrations of the *Iliad* and the *Odyssey* by Flaxman were in every French atelier, and a design was rarely sent out without some reference having been made to that great authority. From the first to the last study of the design made by a French student, he did his best to indicate figure- and ornament-sculpture. If English students did not do that during the period of their studies, they certainly would not when they got into practice; and although at first the efforts might be rather feeble, by continual practice they would be improved. Even if one had only to suggest a figure one or two inches high, it was something to have attempted that, and it was better than leaving it out altogether, and trusting to writing only "figure" or "ornament" to indicate the possibilities of the future. He therefore would impress very strongly on all students the great advantage of always endeavouring in their designs to sketch in, in

some way, the figures and ornament which they intended should, if possible, find a place in their building when finished. It was absolutely the only way in which they could get scale. The present method of leaving blanks, and then afterwards calling in a sculptor, if the client allowed it, to design some figure or ornament, was a mistake, for when put up the sculpture was often out of scale with the rest of the design.

Mr. H. McLACHLAN (*A.*) thought that sculptors in this country had had practically very little chance, for although they had had several opportunities of making monuments to certain well-esteemed gentlemen, or of providing statues to be placed in certain positions on pedestals, yet, so far as relief sculpture and groups were concerned, they had had very little to do on the whole, and therefore not much opportunity of gaining experience. One question that had not been referred to, or only indirectly by Mr. Frith, was the extraordinary humidity of their climate, so that clients felt rather doubtful of spending a large amount of money upon one of the highest forms of art when after a very few years its proper effect might be permanently and totally destroyed.

Mr. F. W. POMEROY considered the old system of apprenticeship had not died out. Most of the Gold Medallists of the Royal Academy had been for five or seven years apprenticed to architects or sculptors. Theory should be studied at one's leisure, but for the ordinary students in architecture or sculpture the proper place to learn the technical side of their business was the workshop.

Mr. WILLIAM WHITE, F.S.A. (*F.*), feared there was no danger at present of too great a combination of architecture with sculpture. Sculpture had taken its stand, as it were, to a very great extent upon personal representations, and what had been called pedestal figures. A great extinguisher was put upon sculpture and painting after the Reformation. All knew perfectly well that at that time there was created a dread of the superstitions which had grown up, or at any rate had been alleged to have grown up, about the numerous sculptures at that day in their churches, and also about the paintings. One would not wish to deny, as had been observed, that there could be, and often was, a very large amount of expression, of poetry, and of imagination and true art in architecture apart from sculpture; but until, in England, sculpture was allied more than it had been hitherto with architecture, neither architecture nor sculpture would fare as it ought to fare.

The PRESIDENT endorsed Mr. Belcher's introductory remark, that if they could not have quantity, at all events let them have quality in sculpture. A little good sculpture applied to architecture was the highest adornment that they could hope to impart to their buildings. He was quite sure that he but expressed the feeling of all architects when he said that what they desired was, not to restrict the cost of sculpture and carving, but to have the best thing that could be proposed by brother sculptors, and to give them the highest remuneration that could be afforded.

XCI.

AMERICAN THEATRES. By MR. HORACE TOWNSEND.

Mr. J. Macvicar Anderson, *President*, in the Chair.

MR. PRESIDENT AND GENTLEMEN,—

OF the various forms of what may be called "public buildings" the theatre is one which, more perhaps than all others, reflects the ethical ideas as well as the æsthetic conditions of the community responsible for its erection. It is, as we understand it, a comparatively modern institution, and one which, to a certain extent, is less hampered either by precedent or tradition than those classes of buildings whose title-deeds to our veneration and respect were dated in a remoter antiquity. But even as regards the theatre the influences of tradition and of that innate conservatism which is common to all peoples, whether civilised or not, have stereotyped certain forms of plan and general arrangement which cause the theatres of all countries to present a family likeness, as it were, though particular features may, and in most cases do, offer points of difference. Thus, towards the end of the seventeenth century, an Italian architect (Fontana) introduced the horse-shoe form into the auditorium, which, with certain modifications, has been usually employed by the theatre-designers of all nations; while, on the other hand, the English, who, it is said, based their early playhouses upon the primitive cock-pit or bear-garden, or else on the galleried inn-courtyard, offer us to-day a survival of this rudimentary form, in their fashion of almost invariably sinking the ground floor of their theatre until it becomes an actual basement, a practice which prevails, so far as I am aware, in no country except our own. In France, on the contrary—where we are told, on the authority of Fergusson, that the theatre is a lineal descendant of the racket-court, with its galleries at one end, its stage at the other, and its *plat parterre* between—the pit, in that almost literal acceptation of the term which prevails with us, is conspicuous by its absence, and it is a somewhat noteworthy and curious fact that, as I shall show you later on, the American theatre-type in this respect follows a French rather than an English progenitor. I say it is curious, for although at the beginning of the present century the United States borrowed avowedly from France in many matters of art as well

as in domestic habitude and sartorial fashion, while even to-day the Gallic influence on American life is easily perceptible, yet the theatre, so far as I have been able to trace its somewhat vague history, has from an historic point of view—and, I should conclude, from an architectural one—also followed the lead of England rather than that of our neighbours across the Channel. To the early colonists the theatre was unknown, for to those of the Eastern and New England States it was, in view of the Puritan denomination of conscience, forbidden fruit; the Southern gentry, the so-called Cavaliers of Virginia, lived, each on his wide-spreading plantation, too isolated a life to foster a form of art which, more than any other, needs the aggregated life of the city to ripen it to any degree of perfection. Thus, though here and there one finds mention of some band of semi-strolling players, it was not until quite the middle of last century that anything like a permanent theatre was established even in New York, which, as it was then the chief commercial city of the country, is to-day, whatever it may be politically or geographically, at any rate the theatrical metropolis of America. In so far as one can judge from the one or two engravings which alone preserve for us its memory—for on the actual site rise to-day some of those sky-soaring buildings whose half-score of floors are devoted to housing the merchants and stock-brokers of that city—the first New York theatre was not unlike one of the smaller and non-patented London play-houses of the same epoch, ridiculously small according to our modern notions, and as paltry in its decorations, as meagre in its comfort, as incommodious in its arrangements, as it was small.

It would probably be as unprofitable as it certainly would be tedious to trace through its various phases of evolution the transatlantic theatre, and it will be enough for my present purposes if I consider the point at which it had arrived a generation or so ago. By this time the Americans had become what I can most decisively term a theatre-going people. Save in Virginia, where the lamentable destruction by fire of the Richmond Theatre in 1811, which was looked upon by many as a direct visitation of Providence, intended as a warning, had checked the otherwise universal proclivity of the larger cities, each had its one or two, or sometimes three, theatres, wherein nightly performances were given. It was the fashion then for every theatre to have what was termed a stock company attached to it, the actors comprising which were engaged for the entire season, their duties being not only to provide on occasion the whole entertainment, but also to support the more famous or "star" performers, who were wont to travel from place to place, carrying with them only their personal wardrobe, and playing, of course, only such standard pieces as the various companies which supported them were supposed to be familiar with. Naturally such a system was but little conducive to a high style of histrionic art, and though, in default of anything better, the theatre was, as I have said, fairly well attended, the buildings themselves were plain and simple to a degree commensurate with the limited return on the investment gained by either manager or owner. In New York, indeed, where better companies were supported, where actors of eminence, such as the elder Wallack, remained at the head of their own companies, a better state of things prevailed. Plays

were better mounted and better housed, and theatres of pretensions—such as the old Bowery, the Academy of Music, and Wallack's—were built at various times. These followed closely enough the English model, with one important exception, and this, though, as I have pointed out, it caused them to conform more closely to the French model, was due to no Anglophobic feeling on the part of the designers, but rather to the necessity of meeting needs other than those prevailing in our own country. It was, I am rather inclined to think, the inherent democracy of the people which led to the planning of the theatre with its "pit" (to use a term unknown in America, but one which best carries out my meaning in connection with this view of the subject) on the ground-floor level, to the abolition of all boxes save the four on each side of the proscenium opening, and to the putting on an equality, so far, at least, as price and place of admission were concerned, of the occupants of pit and dress-circle. Added to this was the practical good sense, unhampered by tradition or convention, which saw that the entire floor of the theatre offered, at all odds, the most desirable place from which to witness a performance, and could therefore on no reasonable grounds be divided, as it generally is with us, into two sections, the occupants of one of which should pay the highest, and the others next door to the lowest, price for their respective accommodation. Thus, in every case, we find the theatre, even at this date, conceived on that most simple as well as most sensible plan, which I can best describe as an oblong block divided into three parts transversely, of which the largest is in the middle and is occupied by the auditorium, the second in point of size at one end is devoted to the stage, while the third is again divided into three by lines parallel to the greatest length of the oblong, and devotes the central of these spaces to the main entrance, which thus leads directly from the street into the auditorium, while in spaces on each side are found the means for ascending to those portions of the house above the ground floor. You will find that the very latest of American theatres, as I shall hereafter point out, is planned more or less upon these same broad lines.

So, until a score of years after the first half of the century, theatre-building in the States offered but few salient points of difference from the same craft in other countries. In point of fact there was not a great deal of it, for only the larger cities could offer audiences sufficiently numerous to support even the most poorly paid of the stock companies, and thus the provincial architect (save when one of the old ramshackle structures, built entirely of wood, was burned down and wiped out of existence) but seldom had an opportunity of exercising his genius in this direction. Indeed, the designing of theatres fell into the hands of one or two men who, as a rule, represented the, happily, almost extinct school of so-called "practical" or "rule-of-thumb" architects, and whose buildings were more or less cast in the same mould, displaying the same faults of plan and the same poverty of invention and poverty of taste in the decorations. I remember, some ten years ago, meeting in Buffalo a worthy old person of this order, who at that time had abandoned the pursuit of his profession for, as it seemed to me, the cultivation of his powers in the assimilation of the national cocktail. He assured me, in a burst of inebriated confidence, that he had

built some twenty-seven theatres in his time, and had used only one set of plans for the whole twenty-seven. He added that, in his opinion, the theories of sight lines and isa-optic curves and so forth, were " pure foolishness " ; that, for his part, he used to set out his seat levels by "squatting on a beam " and telling the carpenters to raise or lower it according to his instructions as he " squinted at the stage." Now, Gentlemen, that is the sort of thing that sounds very well to the outsider, but, as you very well know, it is merely the facile resource of gross ignorance, and the work of men holding such views can never present aught of incentive interest to the cultivated and thinking architect. So we find American theatres which date back beyond the seventies offering us, as a rule, but little that we can admire, save as regards the simplicity and straightforwardness of the planning of their main floors.

It was the result of a wholly extraneous cause that led to the introduction of new ideas, and to the erection, in all parts of the Union, of playhouses of every size, and of every degree of elaboration in point of interior finish, which, one and all, can be compared to their own advantage with any European examples other than those upon which the Governments of their respective countries have lavished enormous sums from the public funds. The cause which produced this happy result was the growth of what is termed in theatrical vernacular the " combination " system. This is not the place, I apprehend, to enter at any length into a description of this movement, which belongs, indeed, to the history of the stage rather than of the theatre considered as a building. It will be sufficient for my purpose to point out that it substituted, in place of the resident stock-company of mediocre talent, travelling companies of the highest order of merit, who confined themselves, each one, to the representation of one play, and were thus enabled to mount as well as act it in a fashion infinitely superior to that attainable under the old régime. Not only this, but they found that in the smallest city one representation, at all events, could be given with satisfactory pecuniary results. All that was required was a theatre proper in the place of the dingy amusement-hall in which, theretofore, the inhabitants of these less important places had been accustomed to gather to the lecture or the reading which had been their only entertainment. On the one side, therefore, were the theatrical profession, on the other the public, both eager for the opportunity of mutual recognition, which only the stage and auditorium of a properly constituted theatre would allow them. The outcome was the only one possible under the circumstances. Theatres sprang up like magic in every town, from Florida in the South to Maine in the North, and from New York in the East to San Francisco in the West. The " theatre architect " of the old school became a personage of the past, and to-day there are but few architects of eminence who have not, in their record of works accomplished, at least one theatre or opera-house to point to. It was, as I have mentioned, during the seventies that this great influx of theatre-building took place, but it was not until the close of that decade that a small theatre, erected on the site of one but lately destroyed by fire in the city of New York, introduced what may fairly be called a new era of American theatrical architecture.

The Madison Square theatre, which presented so many original points of divergence from the conventional arrangements of a theatre, was the outcome of the talents of more than one man. Two brothers named Mallory, of whom one was, and indeed is, a Doctor of Divinity, the other the publisher of a religious newspaper, provided the funds, an exceedingly clever if somewhat erratic actor and dramatic manager, one Steele Mackaye, a portion of the ideas, while two able young architects, Francis H. Kimball and Thomas Wisedell—the latter, I am glad to say, an Englishman—the professional skill which put these theories into practice and materially improved upon them in more than one case. Up till that time the ordinary horseshoe form of balcony or gallery front, with the floor sloping upwards on one plane, was the accepted solution of the seating problem, varied in different cases merely by the flattening or the elongation, as the case might be, of the horseshoe curve; it is, indeed, a solution which to-day in this country is almost universally accepted. Messrs. Kimball and Wisedell went to work on a different plan. It occurred to them that, though the old form offered excellent opportunities of hearing to every one, and equally good opportunities for seeing the stage to those sitting in the central portion of the horseshoe, those seated at the sides could only, under the most favourable circumstances, see that portion of the stage lying towards the side of the house opposite that in which they were sitting. By comparatively simple means they obviated this first difficulty, and at the same time gained a fairly large seating capacity in an auditorium of limited area. The main floor slopes uniformly upwards from the stage, which is raised, by the way, but slightly above the lowest level of the auditorium, and each row of seats on the main floor is raised about $4\frac{1}{2}$ inches, or, to be exact, 11·5 centimetres, above that immediately in front of it. The balcony, or gallery immediately above this main floor, is very deep, approaching in its centre much closer than is usual to the proscenium line; but, instead of the usual horseshoe curve, this gallery front is twice broken abruptly in its outline. In the centre it is a little flatter than semicircular, then comes the break, and the sides are of an ogee form. The pitch backwards of the balcony is broken in like manner. At the break in the outline the pitch is abruptly lowered, so that the side seats near the stage are on a much lower level than those at the back, and a clear view of the stage is thus obtained from every part of the balcony. Access to this part of the house is obtained by three separate entrances, one in the centre for the higher portion and one at each side for the two lower portions. The gallery over follows, in a modified form, the arrangement of that below, but much shallower, while the pitch is correspondingly steeper. As a matter of fact it is the least satisfactory part of the house, but, owing to the style of entertainment usually represented there, this fact works but a trifle disadvantageously to the commercial fortunes of the establishment. I should add that each row of seats in the central portion of the balcony stands on its own level, thus obviating the necessity for any sideway pitch to the seats, as in some cases a drawback to the ordinary balcony. On the main floor the rows of seats run almost up to the front of the stage, but as the latter is so low there is no disadvantage in this, and those sitting here have not to crane

their necks backward in order to view the action in progress. There is no provision on this level for the orchestra, which is placed in a balcony above the proscenium. The arrangement of the boxes, too, presented something of novelty at the time. There are four of them, kept well back out of the line of sight of the seats, two on either side, the upper one being open, but by a simple screen arrangement the interiors are well cut off from the view of the audience. Finally, the proscenium arch, to use a Hibernicism, was not an arch at all, but carried out, not unsuccessfully, the idea of a picture-frame which should enclose the living picture on the stage, in order to interfere as little as possible with which there were placed on either side of it two doors through which it was intended the players should advance when, at the conclusion of an act, they might be called, as the phrase goes, before the curtain. As to novelty behind the footlights there was abundance. Instead of one stage there were two, arranged the one above the other like the floors of a house; the ground beneath the stage was excavated—and as it was discovered to be solid rock I may mention that the expense was so enormous that it wellnigh ruined the entire project—and by an arrangement of steel ropes, drums, and counterweights the two stages move upwards and downwards like the car of a lift or elevator. Thus, while the action of one act is proceeding the scene for that following can be set overhead, and as soon as the curtain falls be lowered instantaneously into place, and the first scene, which is now in the basement, can be in turn reset as occasion offers. Finally, I may add that the Madison Square was the first theatre, in New York at least, to be efficiently ventilated as well as properly heated in winter and satisfactorily cooled in summer. This was managed by means of a large shaft on one side of the stage behind the boxes, with a seven-foot suction fan in the basement, which drives the air into four air-boxes supplied with steam radiators, and placed in various parts of the building; from that again small tin pipes lead to openings under each row of seats. Thus, when the fan is in motion fresh air is drawn from a point above the roof, and after being efficiently warmed is driven into the house, to escape, when vitiated, at openings in the ceiling and under the galleries. Fresh cold air is also discharged from the downcast shaft at various other points. In summer the same system is in operation, only, in place of driving the air over steam radiators, it is passed over enormous blocks of ice.

I have dwelt at what may appear undue length on a small theatre built some twelve years ago, not so much because of its intrinsic importance, or because I regard it as an altogether perfect example of theatre-building, but because it marked a well-defined stage in the history of the development of this class of building in America. It was in some degree, perhaps, owing to the marvellously clever way in which the manager of the new house advertised the many virtues of his possession that it so attracted the attention not only of the architectural profession, but of theatrical managers also; but, whatever the reason, the result was soon apparent. With the practical good sense characteristic of the American people, however, in no case was a slavish imitation of the new house produced, loud as was at first the chorus of approval of all the novel features. It was well that this was so, for time has indisputably shown

that not all of them were commendable. The double stage, for instance, ingenious in theory, has by no means proved that its advantages are either commensurate with its cost or even outweigh its inconveniences. The theory that audiences would prefer an almost instantaneous change of scene has proved fallacious, and, in point of actual fact, the waits between the acts at the Madison Square Theatre have for years been as long as at any other house where the stage is set in the ordinary fashion. For other reasons, too, connected with the practical work of stage-setting, the novelty proved somewhat of a nuisance, and the well-known manager, Mr. A. M. Palmer, into whose hands the theatre subsequently fell, has often expressed to me his desire to do away entirely with the raising and lowering apparatus, and to make the stage stationary, though, owing to the confined space at his command, he found this to be impracticable. Nor was the overhead orchestra quite successful; for, although it is provided with a shell-like sounding-board, it is heard but in muffled fashion by those below, while it is extremely difficult for the leader to catch the "music cues" and give proper expression to the incidental music so often introduced into melodramas and plays of serious interest. On the other hand, the seating arrangements were in the main followed by subsequent designers, while the heating and cooling apparatus was almost immediately introduced into the principal of the existing New York theatres, while it found a place in, I think, all later erections. The picture-frame proscenium gallery was not so immediately discovered to be based on a wholly erroneous idea, and for a time it became, so to speak, fashionable, many new theatres and some old ones adopting it. It was forgotten that in a picture the figures are immobile, arrested at some critical moment of action, or else shown in the stillness of absolute repose, while the characters in a play, on the contrary, are ever moving and changing their plane in respect to the spectator, and thus continually destroying the pictorial composition, a disturbing effect which is heightened by the employment of the spurious picture-frame. So it would seem nowadays that the traditional idea of regarding the proscenium as a mere arch, through which we gaze at the mimic room or bit of natural scenery beyond, were coming once again into favour among American theatre-builders. Whether for good or ill, therefore, the perceptible influence of Messrs. Kimball and Wisedell's theatre may be traced on all theatres erected in the Eastern States during the subsequent decade, with, perhaps, the somewhat notable exception of the Metropolitan Opera House, though, as this latter is avowedly not intended for the representation of anything but musical dramas, and as it is designed primarily for the comfort and convenience of the private box-owners, it is not to be wondered at that it conforms more closely than do the others to the conventional European Grand Opera House.

It may not be out of place here to compare briefly, and without prejudice either to one or the other, the ordinary theatre of New York and London, and to point out the most salient features wherein the one differs from the other; in doing which I beg you will remember that I speak not so much from the point of view of the practical architect, as from that of the playgoer and the traveller. The plan I have taken to represent the American theatre is that of one of the latest built in New York, and owes

its existence to what is, without any doubt, the most renowned architectural firm in the United States, that of Messrs. McKim, Mead, and White. It forms part of a much larger scheme, and one which is so interesting that I think I shall need no excuse if I dwell upon it for a few minutes. When New York was a younger city than it now is, and the city was clustered about the lower end of the island, which it now almost entirely covers, one of the principal railway stations was built by the famous Commodore Vanderbilt in close proximity to Madison Square; but as that locality gradually became the heart of the city, the station was moved further northward, and the enormous building, which covered an entire "city "block," or plot of land 425 by 200 feet, was left on the Commodore's hands. He did not pull it down, but at small expense turned it into a sort of rough Agricultural Hall, where he held horse shows, dog shows, boxing matches, walking matches, and so forth, while once a year it was tenanted by the late Mr. Barnum and his "Greatest Show on "Earth." It was a mal-

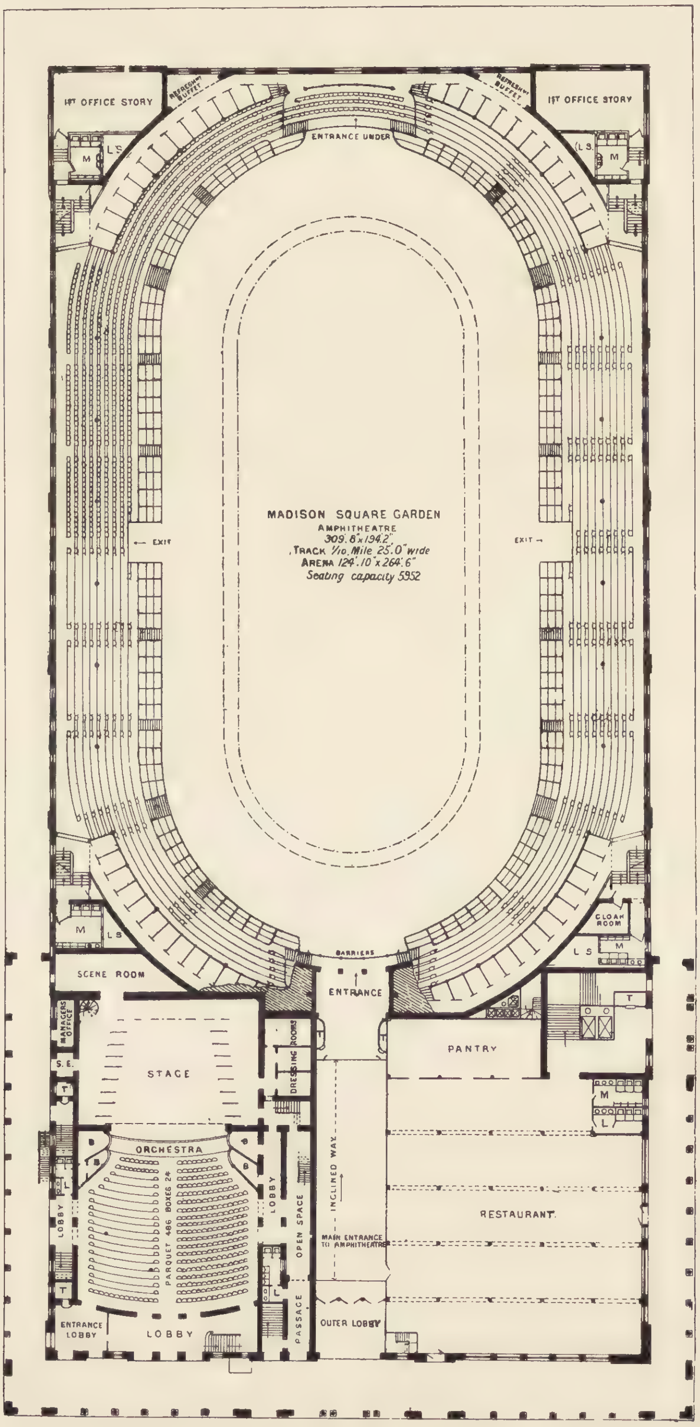

FIG. 8.—MADISON SQUARE GARDEN BLOCK: PLAN AT PAVEMENT LEVEL.
Scale of about 65 feet to one inch.

odorous, ramshackle sort of a place; but year after year it stood there, producing a fair rent, but nothing approaching the interest on the sum of money it represented. Many plans were discussed for the turning of it to a better account, but all proved abortive, until a syndicate of some of the richest bankers and so forth in the city bought the property for some million and a half of dollars (300,000*l.*), and built in it a comprehensive structure devoted to public amusement. The Madison Square Garden block comprises an amphitheatre [figs. 8, 10] some 310 feet by 194 feet, and 80 feet high, with an arena containing 30,000 square feet; a track one-tenth of a mile in length, and a seating capacity of 6,000 people, which can on occasion be doubled; a restaurant [fig. 8], consisting of a main room 80 feet by 90 and a number of smaller ones; a concert hall [fig. 9], with a seating capacity of 1,500; a roof garden 112 feet by 200 in area; a tower 300 feet high, with an observation platform some 250 feet above the pavement; and, finally, a theatre [figs. 8, 9, 11, 12], containing accommodation for over 1,200 people. I have taken this theatre as my text, for it is one of the first built under the new building law, to which I shall have occasion to refer more fully later, and not because it is altogether typically American. It was, I believe, the study of the architects to be thoroughly eclectic in their planning, and to cull the good from every country; and so, as regards the decorative treatment of the stage-boxes, for instance, it is by no means representative of the ordinary American theatre. But I think I shall be able by its means to make my case plain and easily to be understood.

In taking Terry's Theatre as typical of London, I was guided by the same main consideration, namely, its comparatively recent date of erection, as well as by the fact that it is, I think, a thoroughly favourable representative of its class. Both theatres, again, are on an equality as regards their position in the popular estimation, and the character of the pieces produced.

Now you will first of all notice in all probability the greater space which is devoted to the stage and auditorium of the American as compared with the English building, without taking into consideration the space devoted in the former to side corridors and staircases. This is to some extent characteristic, though why it should be so I am at a loss to determine. Land is, on the average, dearer in New York than in London, theatre rents are consequently higher; audiences, one would think, would be slimmer in consequence of the fact that there are over thirty first-class theatres in New York with its population of considerably less than half that of our own city, and yet the typical London house has only a seating capacity some two-thirds as great as its typical transatlantic compeer. Next you will notice the greater simplicity of arrangement; the main floor devoted to seats of the one character and entered almost directly from the street, a wide lobby only intervening, the balcony seated in the same homogeneous fashion and reached by a broad and direct stairway. The gallery, save for its greater size and the greater comfort of its seating arrangements, consequent principally on its lower pitch, hardly calls for mention. Finally, the readier accessibility of the dressing-rooms, some of which open practically on to the stage, and none of which are below the street level, is a point by no means to be overlooked. It is

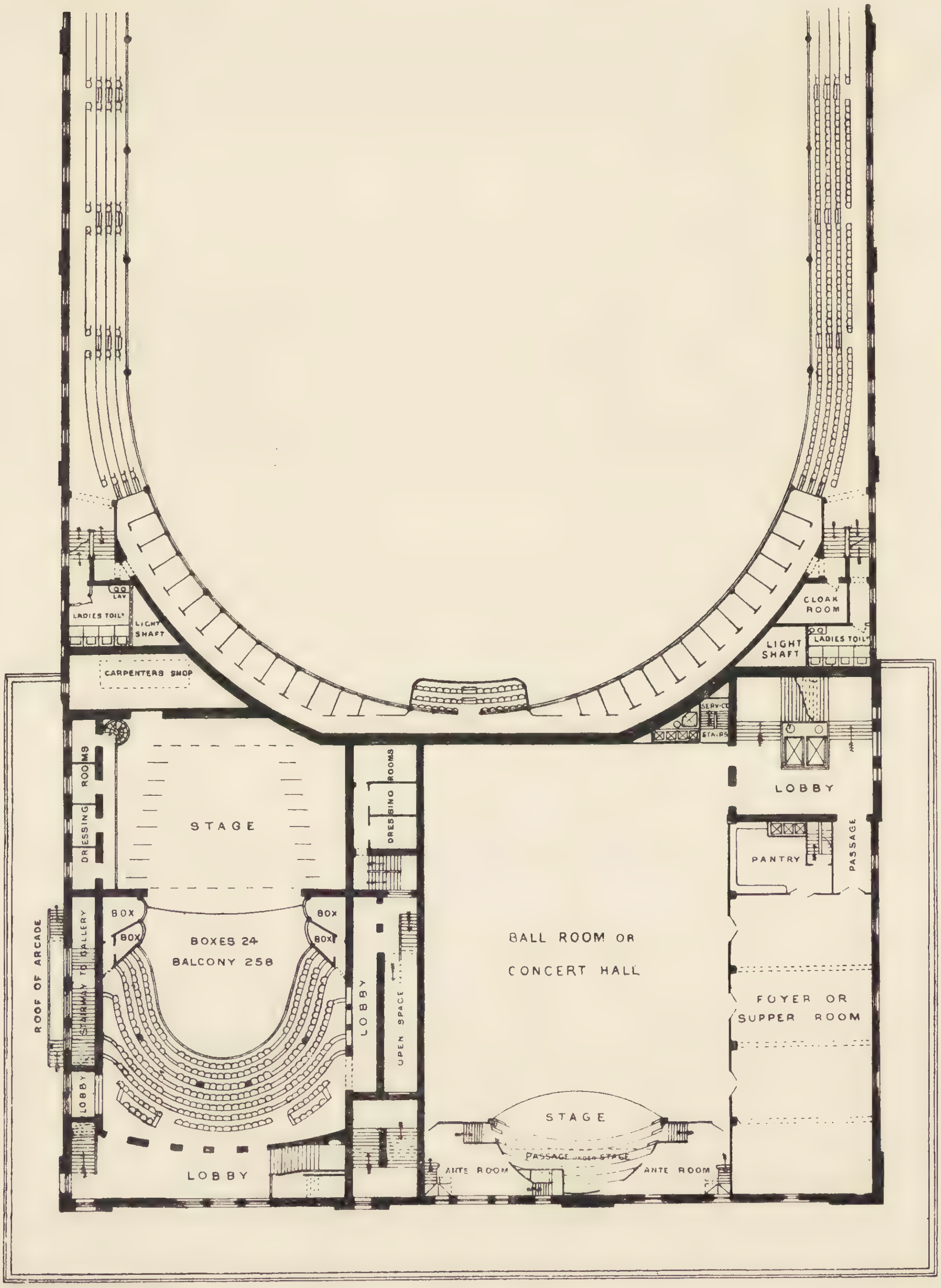

Fig. 9.—Madison Square Garden Block: Part Plan of First Floor.

Scale of about 40 feet to one inch.

only in one or two of the older New York theatres that one finds the latter reprehensible state of affairs. The points I have mentioned are those which I can safely say are common to *all* American theatres, and they are points which, when one comes

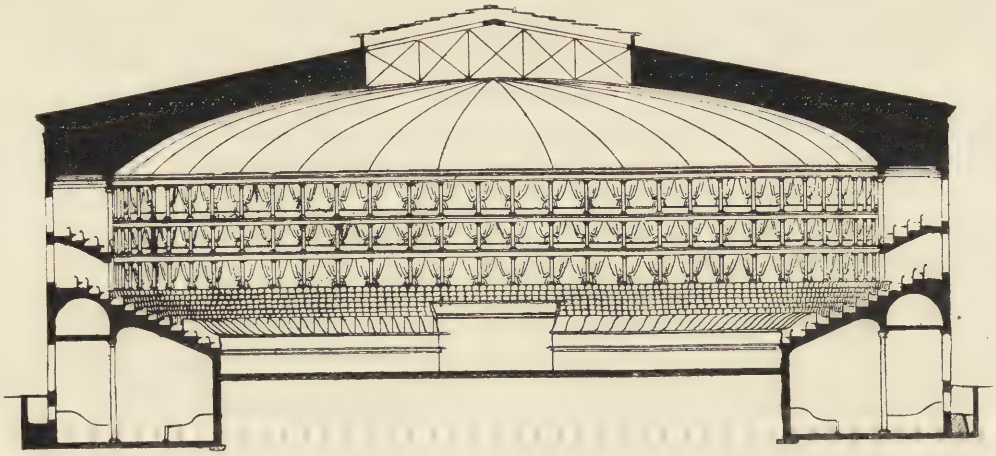

Fig. 10.—Madison Square Garden Block: Transverse Section through the Amphitheatre.
Scale of about 40 feet to one inch.

to consider what they really amount to, irresistibly lead one to the conclusion that our cousins have the advantage over us in regard to the convenience, the safety, and the

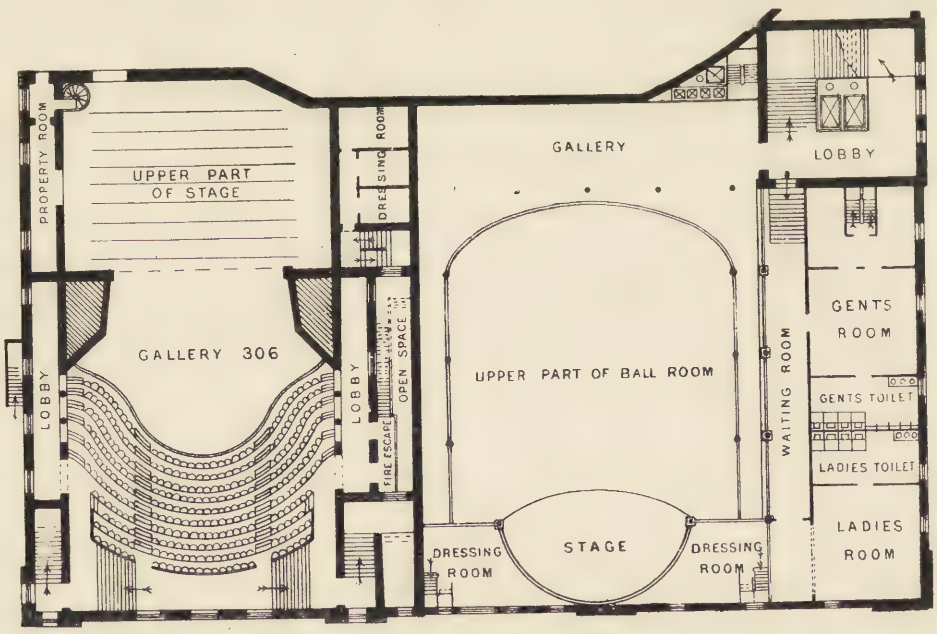

Fig. 11.—Madison Square Garden Block: Part Plan of Second Floor.
Scale of about 40 feet to one inch.

comfort of their theatres. I should not, I think, omit a reference to that most important subject, the heating and ventilation. I am almost tempted to sum up the difference in this respect between the two countries by saying that the Americans heat and

ventilate their theatres as well as cool them when necessary, and that the English do not ; but perhaps this would be going a little beyond the limits of fair criticism. Certain it is that last winter, when I returned from my long exile, I visited in turn nearly every theatre in London, and night after night found myself compelled to sit in the stalls with my overcoat on and the collar turned up, and even then I caught cold. In America, on the contrary, the theatres have a tendency to become too warm even on the coldest of nights, but this is only in exceptional cases after all, and is due rather to the carelessness of the engineer below stairs than to the ignorance of the

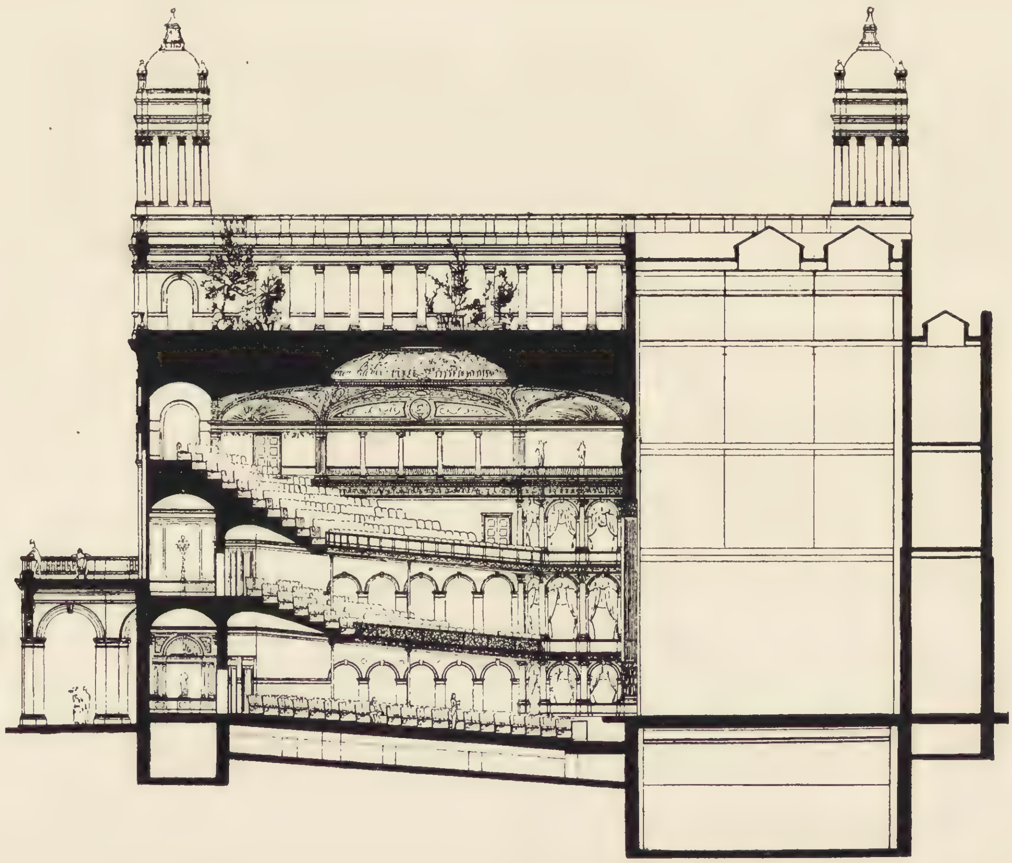

Fig. 12.—Madison Square Garden Block : Longitudinal Section through the Theatre.
Scale of about 40 feet to one inch.

architect or the penury of the manager. In summer, on the contrary, one often finds on an oppressively sultry night that it is cooler in the theatres than outside, on account of the currents of iced air which are introduced in such a manner as to cause no unpleasant draughts. In both winter and summer in all the newest theatres the ventilation is as nearly perfect as may be, more especially since the universal introduction of the incandescent electric light as a means of general illumination.

I have mentioned the fact that New York has some thirty first-class theatres. It will perhaps be within my scope to briefly refer to the salient features of the most

notable of them. Almost immediately after the construction of the Madison Square Theatre (you will please distinguish between this and the Madison Square *Garden* Theatre, which I have last been considering), the same architects, Messrs. Kimball and Wisedell, were commissioned to prepare plans for what is now, under the title of the New York Casino, one of the most beautiful theatres in the world. The skill shown in its planning is fatally marred by one blot, which renders it hardly so safe as one would desire, seeing that its site at the angle formed by two broad streets was an almost ideal one in this regard. It was, however, I believe, made a *sine qua non* with the architects that they should place the auditorium on the first floor, allowing room beneath for an enormous restaurant. Apart from this, however, the building is worthy of the highest praise. The auditorium is large, yet every seat is not only comfortable, but commands an excellent view of the stage; while the manner in which the boxes, of which there are some twelve or fourteen, if I remember aright, are treated is wonderfully clever. From all of them a clear view of the stage is obtained without straining, while they are in no degree an obstruction to the sightseers. The building, both inside and out, is treated in a free Mauresque style, and the beauty and variety of the details, which in the interior are carried out in an incombustible plaster composition, are bewildering. I may add that to his share of the work entailed by pushing the completion of this building through within the prescribed limit of time, the early death of Mr. Wisedell was attributed.

The next theatre of importance was that built by the late eminent comedian, Lester Wallack, and now known as Palmer's Theatre. It was one of the most expensive theatres for its size ever built in New York, but is somewhat conventional and not altogether satisfactory in its treatment, though its seating arrangements are unusually comfortable as regards the liberal allowance of space for each person. It suffers somewhat from the fact that the auditorium is disproportionately long as compared with its width. It is not unlike the London Lyceum Theatre, but is infinitely more pleasing in its balcony and general lines.

Of the Metropolitan Opera House, the largest theatre proper in America, I need say but little. It was built, as I have before remarked, exclusively for operatic performances, and consists of two tiers of private boxes, with two galleries overhead, and a rather contracted orchestra floor below. Its stage arrangements, and indeed its whole plan, are conceived on an exceptionally ample scale. Of other notable New York theatres, I may mention the recently built Broadway Theatre, which has an extremely handsome and well-planned interior, though its external elevation is lamentably poor and weak, and which, as it has wide streets on three sides, is unusually well provided with safety exits; and the Lyceum, a small theatre chiefly remarkable for the excellence of the entertainments there offered, and for the original and beautiful nature of its interior decoration, due to the artistic imagination of Mr. Louis Tiffany. The new Fifth Avenue, Mr. Hammerstein's Opera House, and Harrigan's Theatre have all been built during the past year, but I believe that the first and last of these are most excellent specimens, not only of theatre-planning, but of interior decoration also. My

casual references to decoration, by the way, lead me to say that though I had made up my mind to be silent on the subject, I cannot refrain from adding that the Americans are in advance of us in this respect. We have no theatres that can compare with the Metropolitan Opera House, the Lyceum, the Madison Square or the Madison Square Garden Theatres in that respect, each being distinctly individual, distinctly original, and distinctly pleasing in general effect. Even the vernacular theatrical decoration, though apt to be a trifle meretricious in design, is always tasteful in colour, and perhaps its very meretriciousness renders it not out of place in the home of the drama. Of the other theatrical centres of America, Philadelphia has few theatres that call for remark; while Chicago, now that McVickars's is burned down, finds its chief boast in the Auditorium. This is a truly American building. It is called a theatre, and it serves on occasion the purpose of one, but in point of fact it is an enormous hall, designed chiefly for great musical festivals and political conventions. But though the Auditorium seats as a general thing some five thousand people, it can by an ingenious contrivance be made temporarily smaller when a purely theatrical performance is given upon the stage. This stage itself is most marvellous. It is worked entirely by hydraulic pressure, and is divided into sections of a few square feet in area, each one of which can be raised or lowered to any height or any depth independently of its neighbours by the mere touching of a button. Thus all the elaborate paraphernalia of "built-up platforms" and so forth can be dispensed with by the stage carpenter. No borders are used, but sky effects are produced by a species of domed panorama which gives a curiously realistic effect, a device which has been used, I believe, in this country only by Professor Herkomer at his artistic theatre at Bushey. The Haymarket, a popular theatre of the same city, is chiefly notable to us for the arrangement of boxes, which follows the stepped system of the Madison Square Theatre.

In Boston the older theatres, such as the Boston Museum and the Boston Theatre, are not particularly noticeable, save that the latter is of a remarkable spaciousness. Of the recently erected buildings the "Tremont" is a most favourable expression of the newest ideas in theatre building, with unusually ample foyers and lobbies, and a system of electric lighting which extends to borders and footlights, and to some extent even takes the place of limelights for special stage effects. The Grand Opera House is designed to meet the requirements of more democratic and popular audiences, but is a most favourable example of the class of theatre to which it belongs. Thanks to the courtesy of Mr. Nathan B. Goodnow, the owner, a leading banker of Boston, I am enabled to refer to the working drawings, and point out what seem to me the chief features of interest in them [figs. 13, 14, 15, 16]. One of practical construction concerns itself with the manner in which the balcony is supported. As you will see, this balcony [fig. 14] is of enormous size, containing between six and seven hundred sittings. I may remark in passing that I by no means unreservedly admire the planning of this theatre, though in practice, as I have discovered by personal experience, a good view of the stage is to be obtained from every seat in the house; but the seats to the extreme right and left of the balcony nearest the stage are not the most

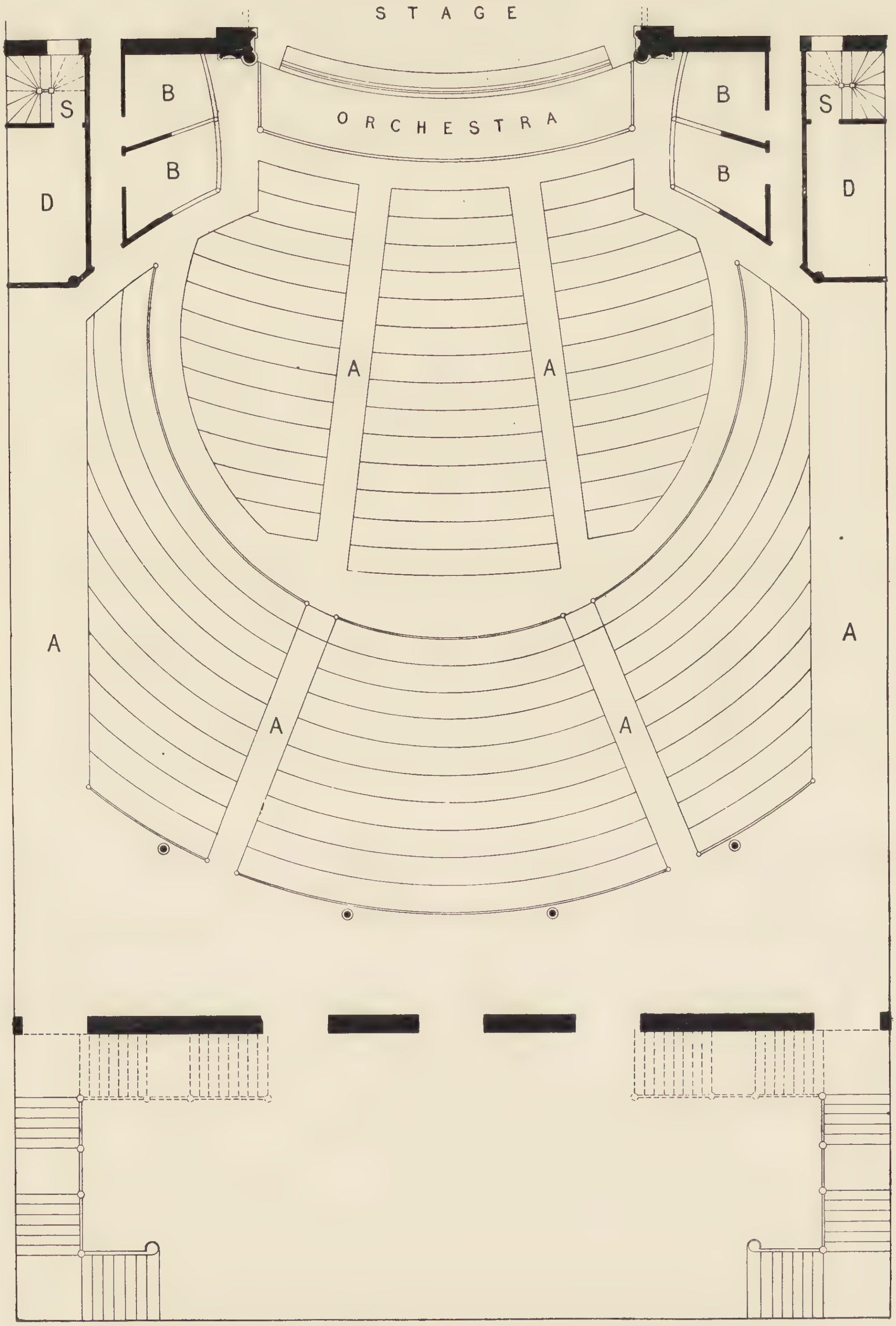

FIG. 13.—DIAGRAM GROUND PLAN OF THE GRAND OPERA HOUSE, BOSTON, U.S.A.
A, Gangways. B, Private boxes. D, Dressing-rooms. S, Stage stairs. Scale of about 16 feet to one inch.

comfortable in the house, owing to the slope of the floor and the necessity for the assuming of a twisted posture in order to face the stage. It was the consideration of this very point which led Messrs. Kimball and Wisedell to employ the abruptly-broken gallery-line in their Madison Square Theatre, by which, though the slope was even greater than in the Boston Theatre, each seat is horizontally placed, and at an appropriate angle to the line of sight. However, the problem which Mr. Goodnow set his architect was one which I think few theatre-owners would trouble their heads about, especially in view of the vast additional expense which a successful working of it out would entail. This problem was to carry this exceptionally deep gallery in such a manner as to obviate the necessity of a row of pillars, which, however carefully they might be disposed, would inevitably conflict with the view of the stage gained by those sitting to the rear of them. Not one of the pillars [fig. 13] used to carry the balcony is in front of any row of seats. The arrangement of girders by which the gallery is supported on these is simple, though, as I have said, the large additional amount of ironwork necessitated entailed a considerable extra expense upon the owner, and all he gained was the satisfaction of knowing that he had done all in his power to add to the comfort of the manager's patrons. It is this temper, so characteristic of the American client, which has done

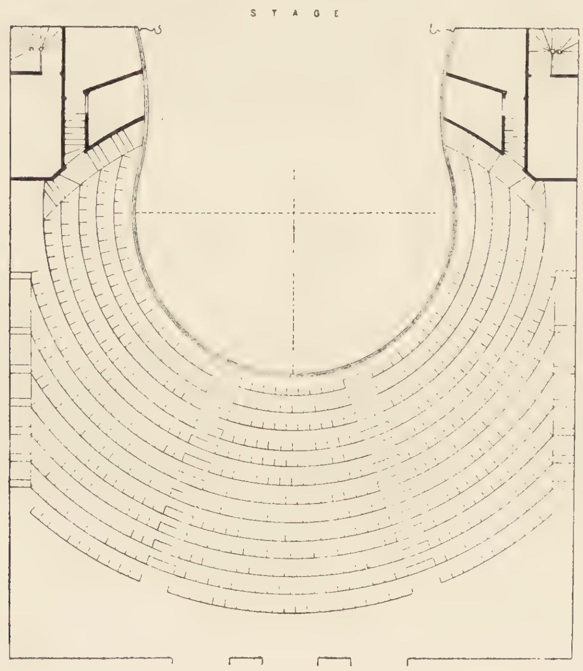

Fig. 14.—Diagram of Balcony.
[See fig. 16.]

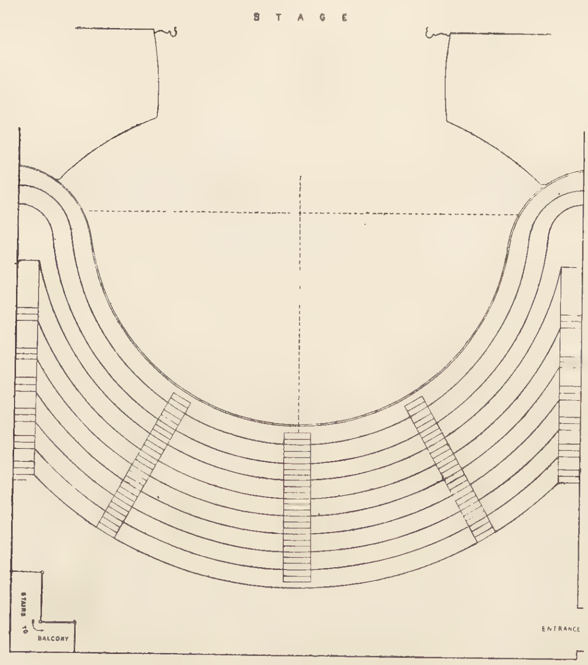

Fig. 15.—Diagram of Gallery.

THE GRAND OPERA HOUSE, BOSTON, U.S.A.

more than all else to foster the growth of a healthy and advanced architectural school in the United States. The best is considered by these shrewd men the cheapest in the long run, and the question most generally asked by the theatrical manager or the outside capitalist who may desire a theatre built is not "How "cheaply can you build it?" but "How well, how safely, how commodiously, and "how beautifully as compared with existing houses?" To use an idiom belonging to the national game of cards, they always "want to see the other fellow and go him one "better." It is perhaps on this account that the recent New York building law was adopted without question and without murmuring, undeniably stringent and

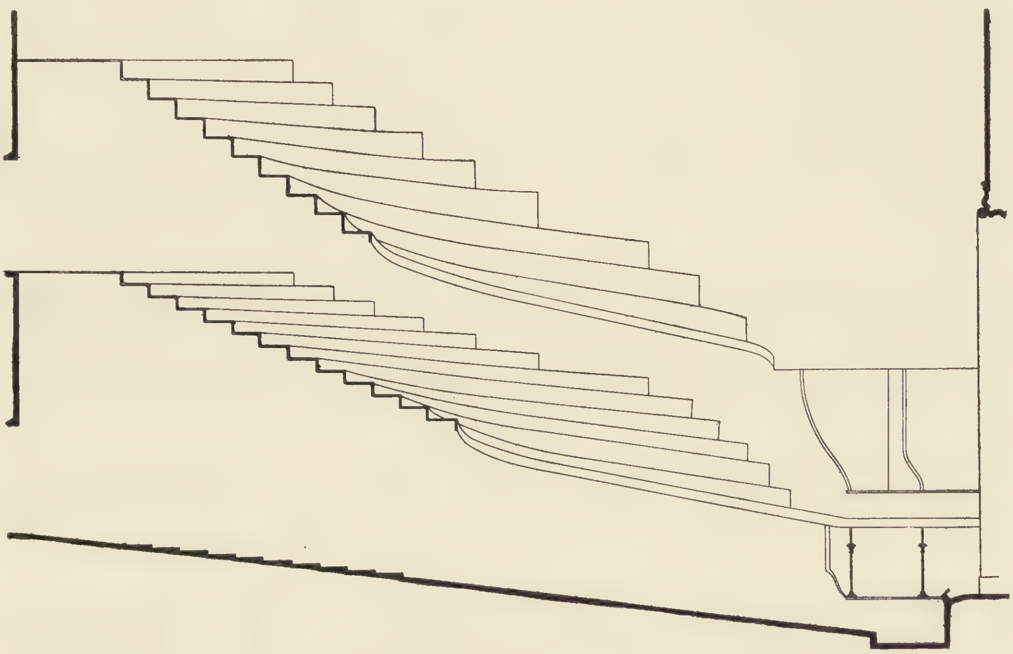

Fig. 16.—Sectional Diagram of Balcony and Gallery at the Grand Opera House, Boston, U.S.A.

[See figs. 14, 15.]

perhaps a little far-fetched as some of its provisions are. It was founded upon the Vienna Law, I believe, with such modifications as naturally suggested themselves to a Department which I am glad to say is that one of the New York City Departments which is the most absolutely above suspicion of double-dealing or reproach of venality.

I will, with your permission, Gentlemen, run through some of its provisions, avoiding such legal tautology as may appear in the original, and omitting such sections as appear to me of but modified interest. I may say that the New York Building Department, without whose permission no one is allowed to erect even a temporary wooden shed, is a branch of the City Fire Department, and the provisions of all the building laws are therefore aimed principally at securing as far as possible the safety of life and property in case of an attack of fire. The careful regulations as to the

thickness of walls relative to their height, for instance, arise from the desire to prevent their falling with ruinous effect should the ties formed by the ordinary floors be destroyed by fire.

Theatre Building Law in New York.

After an introductory section, which provides that until a theatre is certified to be built in conformity with the subsequent requirements, the Mayor shall refuse to license it and prevent its being opened, the Act proceeds to say :—

Every theatre, or any building modelled for that purpose, shall have at least one front on the public highway or street, and in such front there shall be suitable means of entrance and exit for the audience. In addition there shall be reserved for service in case of an emergency an open space equal to one-sixth of the width of the building, outside to outside measurement, and in no case less than eight feet in width in the clear in its narrowest part on the side not bordering on the street where the building is located on a corner lot, and on both sides where there is but one frontage on the street or public highway.*

This open space is to begin from the line of the proscenium wall, and to extend the full length of the auditorium proper to the wall, separating the same from the entrance lobby or vestibule. A separate and distinct corridor shall continue to the street from each space through such superstructure as may be built on the street side of the auditorium, and this corridor is to be reduced in width not more than may be required for the thickness of the outer wall forming one side of the corridor. The openings into and out of the corridor shall not be reduced in width more than three feet less than the width of the open space, and shall be provided with doors or gates opening toward the street. During the performance these doors or gates shall be kept open by strong locks.

The open space and corridors are not to be used for storage purposes or for any purpose whatsoever except for the several exits from the auditorium and stage, and must be kept free and clear during a performance. The level of the corridor shall not be greater than one step above the level of the sidewalk, where it begins at the street entrance. To overcome any difference of level existing between exits from the parquet and stage and level of corridor, gradients shall be employed of not over one foot in ten feet with no perpendicular risers.

From the auditorium, and opening into the open space, there shall be two exits on each side (unless one side is on the street, in which case there may be more than two if desired) in each tier, from the parquet or main floor and each and every gallery. Each exit is to be at least five feet in width in the clear, and provided with doors of iron or wood; if of wood, it is to be covered with iron or tin, both sides and edges. All of these doors shall open outward, and must be fastened with movable bolts, the bolts to be kept drawn during a performance.

* A diagram of a theatre in New York with one front only to the street is given in Mr. Slater's Paper on "Building Legislation," Transactions, Vol. VI. N.S., p. 123.

There shall be a balcony not less than four feet in width in the said open space or spaces at each level or tier above the parquet on each side of the auditorium, of sufficient length to embrace the two exits, and from these balconies there shall be staircases extending to the ground level, with a rise of not over eight and a half inches to a step, and a tread of not less than nine inches. The staircase from the upper balcony to the next below must be not less than thirty inches in width in the clear, and from the first balcony to the ground, not less than four feet in width in the clear. All the balconies and staircases shall be constructed of iron throughout, including the floor of the balconies. Where one side of the building borders on a street there shall be balconies of like capacity, with staircases carried to the ground.

Then follows a paragraph providing very sensibly that no portion of the theatre building shall be used as a hotel or manufactory or for storage purposes, and further that none of the workshops or storage rooms used in connection with the theatre itself shall be allowed above or under either the auditorium or stage or in the fly galleries, but that they shall all be placed in the rear or at the side of the stage, separated from it by a brick wall.

Continuing, the regulations provide that all exterior walls shall be of brick or stone, and that if the façade be of iron it shall be backed with brick of a thickness conformable to the general provision of the building law. Interior walls of masonry shall separate the auditorium from the stage, from the entrance vestibule, and from any room or rooms over the same, also from any lobbies, corridors, refreshment or other rooms. All staircases shall be enclosed with brick walls. A fire-wall, to be built of brick, shall separate the auditorium from the stage, and shall extend at least four feet above the roof. Above the proscenium opening there shall be an arch of fire-proof materials, or an iron girder covered with fire-proof materials, to protect it from the heat; if a girder, there shall be constructed over it a relieving arch, the intervening space to be filled in with hollow bricks of the full thickness of the wall. The moulded frame around the proscenium opening shall be formed in metal or plaster, and filled in with non-combustible materials, and securely anchored to the wall with iron.

A shaft shall be provided over the stage, to and out of the roof, made of fireproof materials throughout, of an area of at least one-eighth of the area of the stage, fitted up with skylights so constructed as to open instantly on the cutting or burning of a hempen cord, or some other equally simple approved device for opening them may be provided.

All doorways or openings through the proscenium wall, in every tier, shall have wrought-iron doors which can be opened from either side at all times. Direct access to these doors shall be provided on both sides, and they must be kept free from any incumbrance. Wrought-iron ladders, securely fixed to the wall on the stage side, shall be provided to overcome any difference of level existing between the floor or galleries on the stage side of the fire-wall, and those on the side of the auditorium.

The entire main floor of the auditorium and vestibule, also the entire floor of the second storey of the front superstructure over the entrance-lobby and corridors, shall be fire-proof, and the partitions in any room or passage devoted to the use of the audience

shall be constructed of fireproof materials, to a height not to exceed six feet, which shall be filled in between. The walls separating the actors' dressing-rooms from the stage shall be constructed of fireproof material. All doors in any of these partitions shall be constructed of wood, and covered with iron or tin edges. All the shelving and cupboards in each dressing-room, property-room, or storage-rooms shall be constructed of some fireproof material. All that portion of the stage not comprised in the working of scenery, traps, and other mechanical apparatus for the presentation of a scene, shall be built of iron beams filled in between with fireproof material, and all girders for the support of said beams shall be of wrought-iron. The ceiling or under-side of the fly galleries shall be covered with iron or tin over the entire exposed woodwork.

All stage scenery, curtains, and decorations made of combustible material, and all woodwork on or about the stage shall be saturated with non-combustible material or otherwise rendered safe against fire, to the satisfaction of the Commissioners of the Fire Department of the City of New York. The proscenium curtain shall be placed at least three feet distant from the footlights at the nearest point. The proscenium opening shall be provided with a fireproof metal curtain of asbestos or similar fireproof material, which shall be raised at the commencement, and lowered at the close of each performance.

All seats in the auditorium, excepting those contained in the boxes, shall be firmly secured to the floor, and no seat shall have more than six seats intervening between it and an aisle, and no camp-stools shall be placed in any aisle. This, as you will see, allows only thirteen seats between the aisles. All aisles in the auditorium shall have a width of at least twenty-two inches for every hundred persons, and no aisle shall be less than three feet wide at its narrowest part, and shall be increased in width towards the exit, at least one inch for every five running feet. Every doorway of communication between aisles in the auditorium, and any lobby, corridor, or passage, shall have a clear opening of not less than the full width of the aisle leading to such doorway. The aggregate capacity of the lobbies, corridors, passages, and rooms for the use of the audience must, on each floor or gallery, be sufficient to contain the entire number to be accommodated on said floor or gallery in the following ratio, viz., two hundred and fifty superficial feet of floor room to be allowed for every hundred persons.

Provisions follow for the employing of gradients wherever possible to overcome slight differences of level, for the providing of all enclosed corridors with staircases with hand-rails, for the providing of two exits to every theatre accommodating five hundred people, no such exit to be less than five feet in width; while for every hundred persons in excess of five hundred, twenty inches additional exit is to be allowed. All doors, of course, are to open outwards, and to be unlocked during the performance.

Separate places of exit and entrance are to be provided for each gallery above the first, for which latter and the main floor a common exit and entrance may be provided. Stairs must be of fireproof material, and if straight, four feet wide; if winding, five feet, when they are intended for the exit of not more than fifty people; six inches to be added for every additional fifty to be accommodated. Risers are to be seven inches at most, and treads eleven inches at least, while in circular stairs the tread

is not to be less than seven inches at its narrowest end. Two separate staircases are to be provided for each gallery and for the stage, in each case situated on opposite sides.

Stringent provisions are then inserted as to the provision of "stand-pipes" with their attachments on both sides of each tier of auditorium and stage respectively, and of automatic sprinklers with fusible plugs at such intervals as to protect every square foot of the stage when in operation. Finally the gas arrangements are considered; all portions of the building devoted to the use of the public are required to be efficiently lighted, independent connections for stage and auditorium are required, and provision is to be made for shutting off the gas from outside. On every floor the regulations for the protection of the public against fire or other accident are to be posted, together with a plan of the floor showing the exits clearly, in addition to which each exit must have the word "EXIT" painted above it in letters not less than eight inches high. I may add that the law requires every programme to have printed upon it a clear diagram of each floor of the house, showing all exits and entrances.

If I have occupied too much of your time with this abstract of what appears to me a thoroughly well-considered setting forth of the essential elements of a safe and commodious theatre, you must forgive me. It is not many years ago that Mr. Henry Irving, whose authority in matters connected with the English stage can hardly be questioned, published in most elaborate fashion his notion of an ideal London theatre. A reference to the plan will show that in the main, and with but a few changes due to a necessary conforming to the traditions of the English playgoer (and none of these changes, I may venture to say, are for the better), the new so-called Irving Theatre is but the old American theatre writ large. We have the stage with its double staircase and its central shaft for the centralising of the draught in case of fire; we have the auditorium with its main floor on the street level, and its simple balcony overhead, with the consequent and important absence of any narrow winding stairs to be ascended in case of a fire or panic; and we have the multiplicity of side exits, whether directly on to the street or on to a fireproof balcony, which are essential features of the Transatlantic playhouse. I need not point out that the arbitrary and, as it seems to any but a Londoner, unnecessary division of the main floor into the three divisions of stalls, pit, and quasi-gallery, with the consequent inconvenience and expense of separate pay-places and other accommodations, is altogether English in its conception.

HORACE TOWNSEND.

ABSTRACT OF THE DISCUSSION.

MR. C. J. PHIPPS, F.S.A. (*F.*), had heard so much about American theatres from one and another, that they were so very far in advance of English theatres, that he had expected certainly to learn something; but he was bound to say that he had

not learnt anything. He did not think the Madison Square Garden Theatre would pass the authorities in London, and failed to see any great novelty about it; in fact, he saw a great many positive disadvantages in every one of the plans. The proposition that Mr. Townsend began with, that the American theatres were different from any other theatres because they had no pit, was simply to his mind a difference of expression. The whole of the area called pit and stalls, so far as he could see in most of the diagrams, was precisely the same as in their theatres. The Americans had one price for the whole of that area, and he presumed the better price; but in London, or in any part of the United Kingdom, if the people that were called upon to pay 10*s.* 6*d.* were put under one of the balconies, in seats for which the usual charge was 2*s.*, they would very much complain. Then it was made a feature that all the American theatres had the floor of the house on a level with the street. But that was not very novel. Drury Lane, in London, was on a level with the street; the Princess's Theatre was on a level with the street; and a great many theatres that he could mention, both in London and in the provinces, were all on a level with the street. But where was the advantage? It was simply a question of situation. The American was a two-tier theatre; most of the theatres in England were three-tier theatres. Whether such an arrangement might be beneficial or not in two-tier theatres he did not say; he did not think it was; but where you had a three-tier theatre, it was to his mind very much better to drop the floor of the house below the level of the street, so that the people in the top gallery should have one flight less of stairs to come down; and he had endeavoured to do that in one or more theatres that he had built lately. In the case of the Exeter Theatre which was burnt down, the pit was on the floor below the street. There were 500 people in the pit of that theatre at the time of the fire, and every one of those people got out without being injured in the slightest degree. There were only 190 people in the gallery, and 120 of those were killed, that was to say, suffocated. So that he did not see very much advantage in having the pit or the area of the floor of the house on a level with the street. For a theatre 90 feet wide it appeared to him that the front lobby of the Madison Square Garden Theatre was very poor and insignificant, being not more than about 10 or 15, or at the most 20 feet wide; and at the end of it was a very poor staircase leading up to the first tier, while he did not see the double staircases to the upper parts of the house. The Madison Square Theatre he knew very well. There was a peculiar arrangement of private boxes. The people who went into those private boxes went there, he should say, simply to be seen. As regarded the orchestra above the stage, that was a very peculiar arrangement, which he did not think had ever been done before or since. He did not think there was anything very novel about the frame of the picture that Mr. Townsend spoke of. When he (the speaker) reconstructed the Haymarket Theatre in London, Mr. Bancroft came to him, and with the greatest amount of secrecy confided that he had some wonderful thing which he almost bound him by an oath not to divulge. He said that he wanted the whole thing made into a frame, and the frame along the front of the stage, as well as all round. He did not like it himself at all, because it gave him the

idea of the whole arrangement on the stage being in a picture, instead of people treading on a stage as living people; and Mr. Tree, when he took the Haymarket, immediately had the frame disestablished. He did not think it was quite fair for Mr. Townsend to put forward the little Terry's Theatre as a comparison with the magnificent Madison Square Theatre. To bring forward that theatre as being the latest and most approved theatre in London would appear, he thought, to those who lived in London, a little absurd; and Mr. Townsend might have criticised with more effect some of the larger and more elaborate theatres. It appeared to him that the height from the second gallery to the roof of the Grand Opera House of Boston was enormous, and out of all proportion. He believed it was put forward also, that in the Madison Square Theatre, which was built in the seventies, the architects adopted a novel form of construction in the shape of their balconies. Looking at the plan of the gallery, it appeared to have a different curve from that of the balcony; but there was nothing very new, so far as he could see, in the arrangement of the curve of the gallery. The arrangement of the upper gallery was different, but that was not a novelty. In the sixties he had constructed several theatres with balconies of precisely that shape. The plans of many of those had been published, and the gentlemen who constructed the Madison Square Theatre might have seen those plans. As to Mr. Irving's model theatre, it was really by Mr. Darbyshire, in consultation with Mr. Irving, and Mr. Darbyshire had since brought it somewhat into reality by rebuilding the Exeter Theatre after the same model. It resolved itself into a very large hall with galleries round; and if Mr. Irving had been building a theatre, he (the speaker) did not think that he would build it upon that model. There were no vestibules; there was no place for people to congregate; and the staircases leading down from the upper tiers came down in a straight line. There was a great deal in what Mr. Townsend said about the ventilation of theatres. The English had plenty of well warmed theatres, and the warming was necessary in consequence of the adoption of the electric light; but they trusted to a sort of happy-go-lucky arrangement for ventilation. Scientific ventilation was very expensive. Some years ago, at the instance of the Prince of Wales, he went to Frankfort with Mr. John Hollingshead, specially to study the ventilation of the Opera House there. It was ventilated on exactly the same principle as the Opera House at Vienna, that was to say, it was scientifically ventilated, and heated and cooled. But the cost of that was 25,000*l*. It entailed the employment of two chief engineers, six sub-engineers, and a perfect army of stokers and other employés to keep it going; but it was absolutely perfect, and every part of that theatre could be kept at a temperature of 62° summer and winter. The fresh air was drawn in from some distance off on three sides to twenty feet below the level of the vestibule and entrances. There it accumulated over pipes which were heated in the winter, and in the summer was cooled by a spray over ice. Then that air was pumped into a chamber underneath the auditorium, and by a very ingenious arrangement of pipes and tubes and flues, every single box and every single stall had ventilation brought to it. Then there was a control office immediately under the vestibule where you could sit and touch

a little bell, or a little disc, and find out exactly what the ventilation was in any particular box or in any particular stall or seat in the whole house, and if they wanted a little more cold air or a little more warm air they could have it. Underneath the pit there were three floors of what were called mixing chambers, and all the air was warmed or cooled to a temperature of 62°. The Prince of Wales when he was there was so struck with the temperature of the theatre in the summer as being so much cooler than the outside air that he said to Mr. Hollingshead, "Why can't we "have this in London?" The practical outcome of that was that it cost 25,000*l.* to do it, which was about the figure we generally had, as a matter of fact, to spend in building a theatre. That was of course done by the municipality; but municipalities in England were not quite so liberal. He did not recognise in the regulations which Mr. Townsend had read any great divergence from the regulations which were in force in London—in fact, their regulations were almost as stringent, if not more so. The only thing was they did not insist on the iron curtain, as he thought they ought, and they had no arrangements for making the scenery incombustible. In his opinion, the question of the iron curtain was the most important of all. Unless they could cut off the communication from the stage to the auditorium so as to stop smoke coming through in case of fire, all their good entrances and exits, and all their appliances for fire in front of the house, were useless. It was the smoke that killed the people, and not the fire; and if there were an iron curtain which came down in, say, half a minute, then he thought they would have a complete severance between the auditorium and the stage, and the danger would be practically averted, because the audience would not see the danger, and everybody could get out. The first two or three of the iron curtains he had had made were of double iron plates, with six or seven inches space between; since that time he had always put up the curtains invented by his friend Mr. Max Clarke. They were very light, weighing not more than four tons, and being raised and lowered by hydraulic pressure, they were down in less than half a minute. A theatre at Brussels appeared to him to provide the greatest amount of safety for the audience by means of galleries. It was a most ingenious arrangement. The galleries attached to the outside walls were narrowest at the top tier, so that the people could drop from one tier to the other till they got to the street. At the Lyric Theatre, in London, the whole of the stage—every bridge and every border—could be worked by hydraulic pressure, but it had never been used.

Mr. THOMAS BLASHILL (*F.*) was disposed to agree with Mr. Phipps, that although there were some things, notably the iron curtain, in which they in America were in advance of themselves, there were others in which the English were rather in advance of them. He noticed upon the plans of some of the American theatres somewhat confined arrangements for exit and entrance, for lobbies and for other matters of convenience of the audience and the actors, apart from the actual auditorium and the stage, both of which parts seemed spacious; but Mr. Townsend had said nothing about what were called sanitary arrangements.

Mr. H. W. BURROWS (*A.*) considered that in England they were very deficient

in tabulating formulas for escape, not necessarily in connection with theatres alone, but in connection with other buildings. Mr. Townsend had read to them the building regulations of New York, and the very elaborate precautions and statement of particulars which architects had to follow in designing a building for escape from fire. In the new Factory Act which had just been passed there was a very broad statement that buildings should be designed in such a way that escape from fire should be provided for; but there were no particulars at all, and in designing a building one was left in the dark as to how much space there should be for staircases, how much corridor space, and so on. He thought if in that particular alone they followed the New York building authorities, they would be very much better off.

The PRESIDENT thought that the construction of the stage floor in a series of compartments all under hydraulic power, so that any portion of a few feet of floor could be raised or lowered to any level without complicated staging, was somewhat original and ingenious.

Mr. TOWNSEND pointed out that the Madison Square Garden Theatre had no connection at all with the Madison Square Theatre. The novelty of the gallery line to which he had referred was confined entirely to the Madison Square Theatre. The Madison Square Garden Theatre had only been built last year, and conformed more closely to European and to English models than any theatre that had been built in New York for some years; therefore it was quite possible, if not probable, that the lines of one of Mr. Phipps's theatres had been adopted by Messrs. M'Kim, Meade, and White. The point that he had made about the pit had nothing to do with the seating, or the prices of the seating. In America the ground floor, the main portion of the house, was given up to the best seats, and was, as a rule, on the street level, or very nearly so. Though there might be several cases in London of theatres which followed that rule, in the majority of the London theatres the stalls, the best part of the house, were at a level very much below that of the street, and those stalls were generally reached by narrow and winding passages; and it would be obvious to ordinary capacities that theatres built upon a level with the street were bound to be much safer in case of fire, and the resultant sudden outrush of the audience, than theatres in which they had to fight their way up narrow and winding staircases. He had also pointed out that the position of the orchestra above the proscenium arch had not proved successful; and that, in his opinion, the picture-frame idea of the proscenium arch was a mistake, and as such had gone out of fashion entirely in America. He did not say that Terry's Theatre was the best or most approved in London, but had simply taken it as a representative theatre. He had compared its plan and elevation with those of several other theatres, and found them to be very similar. The Boston theatre, as he had also pointed out, was not representative of the most elaborate class of theatre. It was distinctly a popular theatre—a theatre that answered very much to the Grand Theatre, Islington. It struck him as being very remarkable, that in a theatre built for such purposes, and without any display or elaborate decoration, the owner, probably at the instance of his architect, had gone to such extra expense,

in order to make it more commodious and comfortable. He had failed to find any ordinary theatre in London in which that same principle had been carried out. Mr. Irving had collected many plans of theatres when in America, and had told the speaker on more than one occasion that he thought that what they agreed in calling the vernacular American theatre was distinctly and in every respect superior to the theatres of the same class in England. That, he thought, was also the opinion of every English actor or acting manager visiting America to whom he had spoken during a residence there of some six years as dramatic critic of one of the New York papers. As to the warming and ventilation of theatres, the Madison Square Theatre was well warmed and well ventilated in winter, and well cooled in summer, and by a very elaborate arrangement of pipes, leading under every seat; but it certainly had not cost anything like 25,000*l.*, and the system was run by one man with an assistant, and the cost was comparatively little except for ice and coal. One point in the regulation as to fire—and that he did not think was made a *sine qua non* by the London authorities—was a very important one, and that was, that over the stage of every theatre there should be a skylight and shaft, of fireproof materials, so arranged that at the first outbreak of fire, the first rising of temperature in the lower part of the stage, the skylight should automatically open and form a great air-shaft or flue which would carry the smoke, which was so dangerous, up in a direct line from the stage and prevent its bursting into the house, as it had done in the case of the great Vienna fire. The iron curtain certainly was the essential of a safe theatre. In regard to what Mr. Blashill had said, the sanitary arrangements of the New York theatres, he thought, compared most favourably with the London theatres in every respect. He had been in every theatre in New York, both behind and before the scenes, and there were only two there which had dressing-rooms below the level of the street, and those two theatres had been built long ago.

[APPENDIX.]

THE ROYAL ENGLISH OPERA HOUSE, LONDON, AND THE MUNICIPAL THEATRE, AMSTERDAM.

THERE is perhaps no class of building which has received so much attention during the past ten or twelve years, and shown such rapid strides of improvement, both in construction and planning, as the modern theatre. In his excellent Paper on American Theatres, comparisons have been drawn by Mr. Townsend between the American and the English theatre; but he has not been happy in his choice of an example of a London playhouse, as he selected for illustration one of the smallest

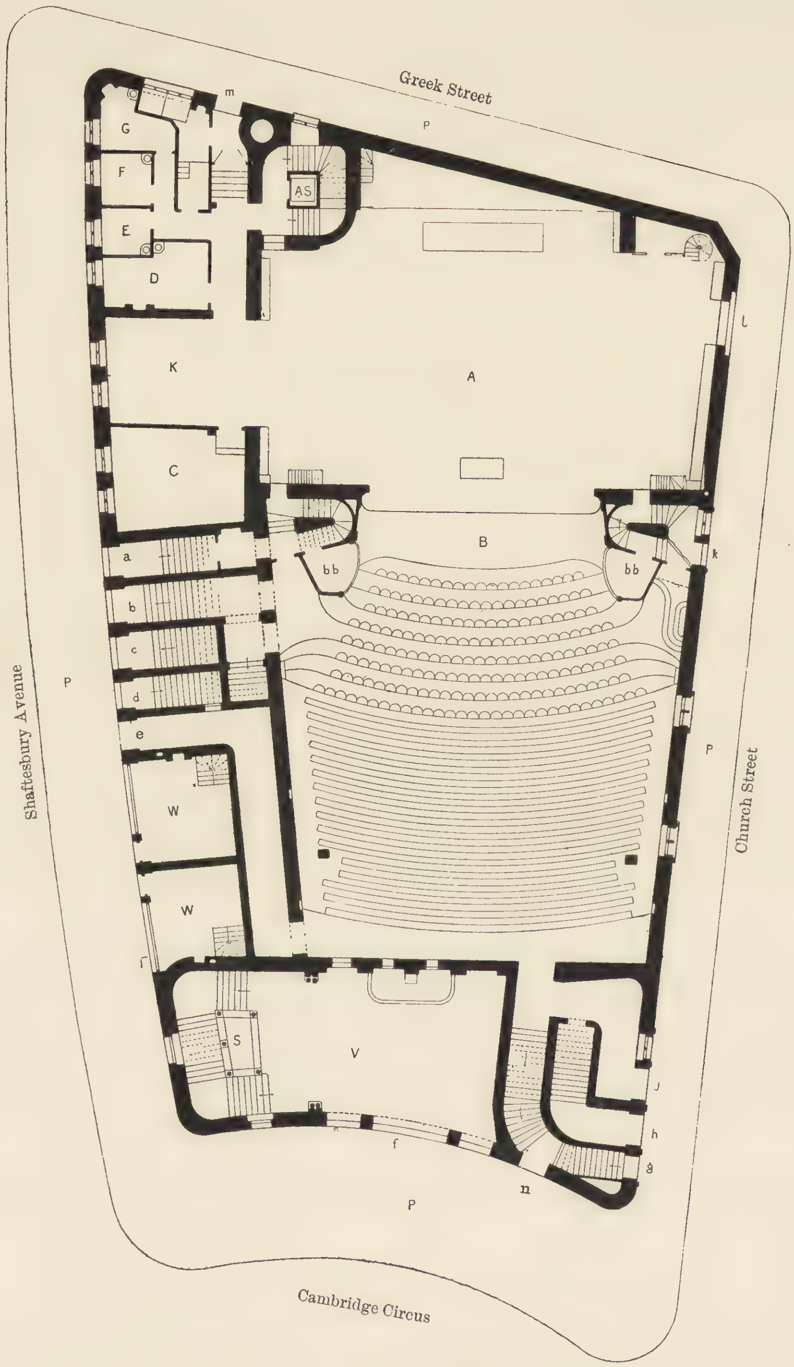

FIG. 17.—PLAN AT LEVEL OF STREET PAVEMENT.

Scale of about 28 feet to one inch.

A, Stage. B, Orchestra. C, Chorus-room. D, Green-room. E, Stage manager. F, Musical director. G, Chief machinist. K, Scene dock. P, Street pavement. A S, Stage stairs and lift. S. Grand Stairs. V, Vestibule. W, Shop (2). *a*, Royal entrance. *b*, Stalls exit. *c*, Gallery exit. *d*, Second circle entrance and exit. *e*, Pit entrance and exit. *f*, Stalls and dress circle entrance and exit. *g*, Basement exit. *h*, Gallery entrance and exit. *j*, Pit exit. *k*, Emergency door. *l*, Scene door. *m*, Stage entrance and exit. *n*, Dress circle exit. *b b*, Private boxes (2).

Fig. 18.—The principal Front, facing Cambridge Circus.

English houses, erected upon a site on which it would be difficult for the architect to produce a "model" theatre.

Although I cannot go so far as to say the theatre, which it is now my duty to

endeavour to describe, is a "model" one, without any fault, I think it is a fair example of what has been and is being done in London, in advancing and perfecting the planning of public buildings devoted to the drama. Far be it from me to depreciate the merits of the example chosen by Mr. Townsend, or to draw comparisons between that house and the Royal English Opera House, the plans of which are here reproduced by the special permission of Mr. D'Oyly Carte, to whose energy London owes such a valuable addition to her public buildings.

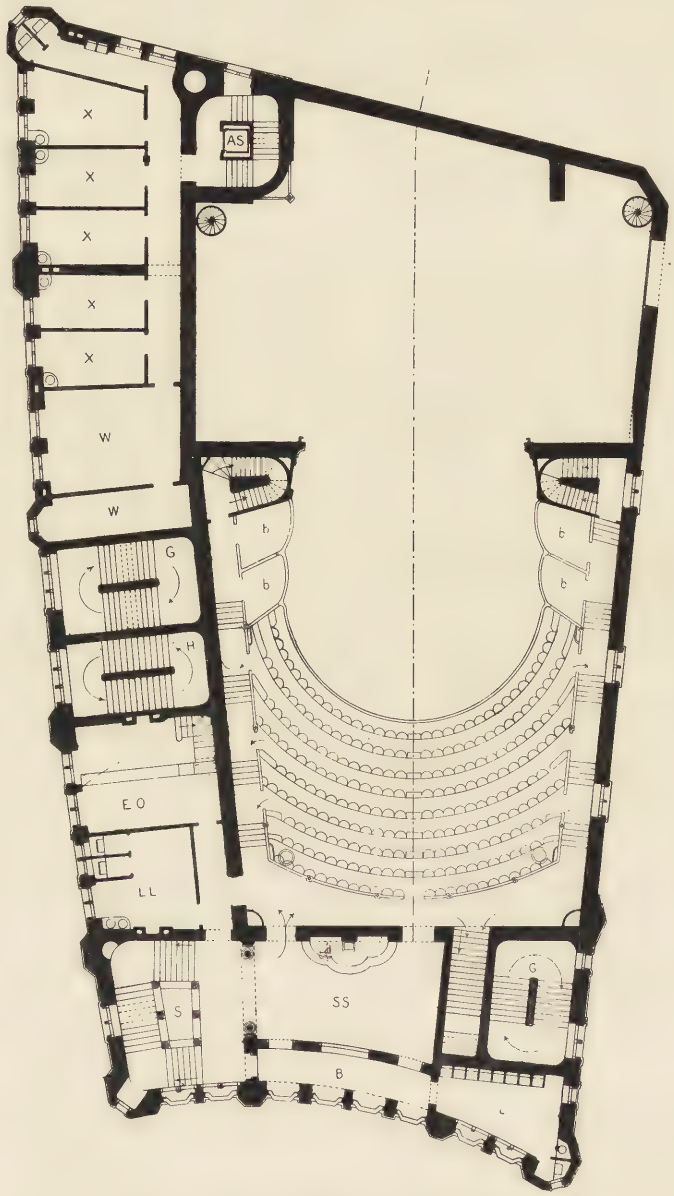

Fig. 19.—Plan of First Floor (Dress Circle).

Scale of about 28 feet to one inch.

B, Open balcony. E O, Enquiry office. G, Gallery stairs (2). H, Second circle stairs L, Gentlemen. L L, Ladies. S, Grand stairs. S S, Saloon. A S, Stage stairs and lift W, Wardrobe stores (2). X, Actors' dressing-rooms (5). *b*, Private boxes (4).

The crux of the whole question of theatre planning is the suitability of the site; a perfect site is an isolated one, and the Royal English Opera House could claim such perfection, were it not for the introduction of the two shops W W shown on the plan taken at the street pavement level [fig. 17]. Following the line of Cambridge Circus, the principal façade takes a concave form, and from the ends of this concave the "return "façades"—that is to say, the north and south walls—strike off each at a somewhat oblique angle. The angles of the front façade, which were the weak points, had to have imparted to them "strength, dignity, and grace," qualities which the architect of this theatre, Mr. Collcutt, has secured [fig. 18]. Each angle of the principal façade has been finished with an octagonal turret, starting about twelve feet from

the ground, and ending beyond the top level of the building in an octagonal dome. The space between these angle turrets—in other words, the whole façade—is divided into three vertical parts by two smaller octagonal piers or turrets; and the centre division is subdivided into three vertical parts by piers, each of which ends in a pinnacle surmounted by a figure holding an electric light. The horizontal sections of the façade correspond to the internal distribution into circles and galleries. The materials employed for the elevations are red Ellistown brick and Doulton terra cotta.

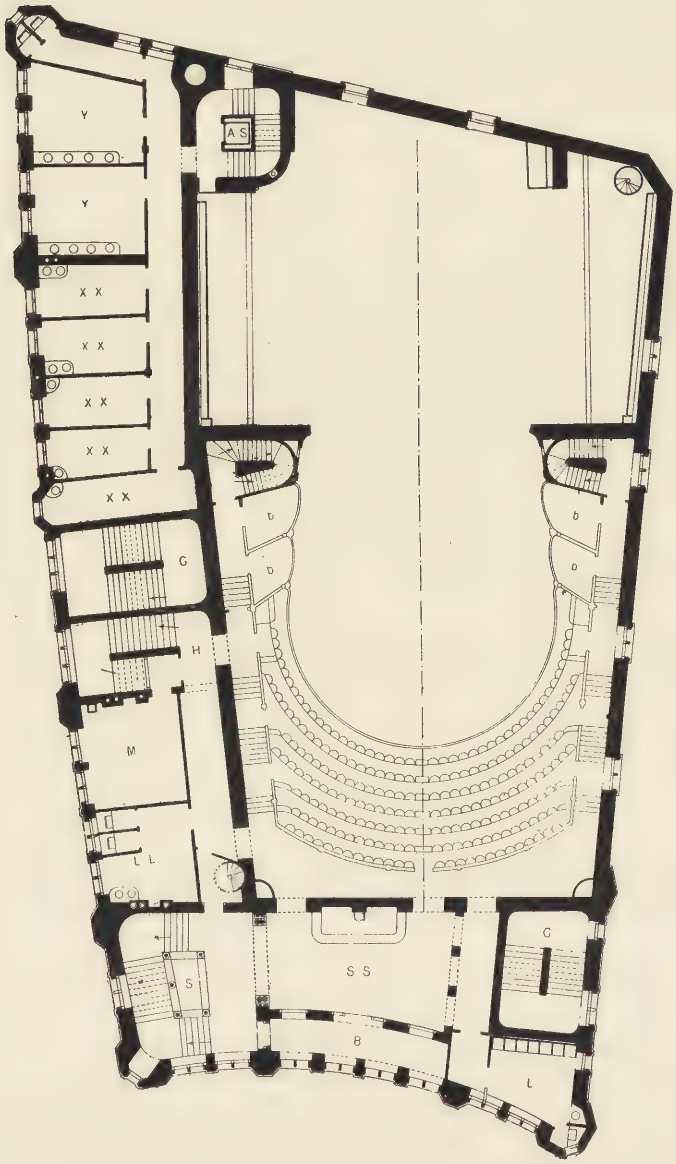

Fig. 20.—Plan of Second Floor (Second Circle).

Scale of about 28 feet to one inch.

B, Open balcony. G, Gallery stairs (2). H, Second circle stairs. L, Gentlemen. L L, Ladies. M, Manager's room. S, Grand stairs. S S, Saloon. A S, Stage stairs and lift. X X, Actresses' dressing-rooms (5). V, Female chorus dressing-rooms (2). *b*, Private boxes (4).

The principal approach to the theatre is in Cambridge Circus; here the occupants of the stalls, private boxes, and dress circle enter the vestibule V [fig. 17], the walls of which are of white Italian veined marble, the dado being green, with a capping on the plinth of marble of darker hue. On the left of the vestibule is the grand staircase S, descending to the stalls and stage boxes, and ascending to the dress circle, the second circle, the saloons and smoking-rooms, which are situated on the dress circle and second circle levels S S over the vestibule [figs. 19, 20]. The whole of the grand staircase S is constructed of marble, and is supported upon rich green columns of the same material; the handrail and plinth are of *grand antique*, the balusters of alabaster, and the steps of veined marble, the walls being lined with Derbyshire alabaster.

The grand saloon S S [fig. 19] is treated in the same richness of style; here the walls are lined with Pavonazz, an Italian marble of great beauty; the dado is of red jasper, and the shafts and pillars are of an Algerian marble.

The grand tier is entered, as already described, from Cambridge Circus, and has a separate exit staircase *o* [fig. 17]. The second circle entrance *d*, in Shaftesbury Avenue, has a separate staircase H [fig. 19], and the two staircases to the amphitheatre

Fig. 21.—Royal English Opera House, London.
Longitudinal section (scale of about 33 feet to one inch).

and gallery on the topmost floor of the house are well planned and of ample width; they are marked G G in the plan [fig. 20], and deliver the one into Church Street at *h*, the other into Shaftesbury Avenue at *c* [fig. 17]. Generally the exits and entrances are admirable.

The arrangements made for the sighting and for the acoustics of the auditorium have proved a great success. To Mr. J. G. Buckle, who was consulted upon this point, much is due, as he originated the idea of "making up" the sides of the rows of seats to improve the sight-line.* The accompanying longitudinal section [fig. 21] shows how the form of ceiling adopted, sloping upwards towards the gallery, in no way breaks up the sound waves proceeding from the mouth of the actor on the stage, but leads the sound into the deepest recess of the gallery. It has been stated that the sloping in of the main walls and narrowing the auditorium as it recedes from the

* Compare the slope of the first and second circles, and of the amphitheatre, with that of the balcony and gallery at the Grand Opera House, Boston, U.S.A., shown in fig. 16 [p. 81 *ante*].

stage is an advantage for sound. This is, however, quite adverse to the most accepted authorities, and in direct opposition to the principles of the plan adopted by the great composer Richard Wagner in his Bayreuth Theatre.

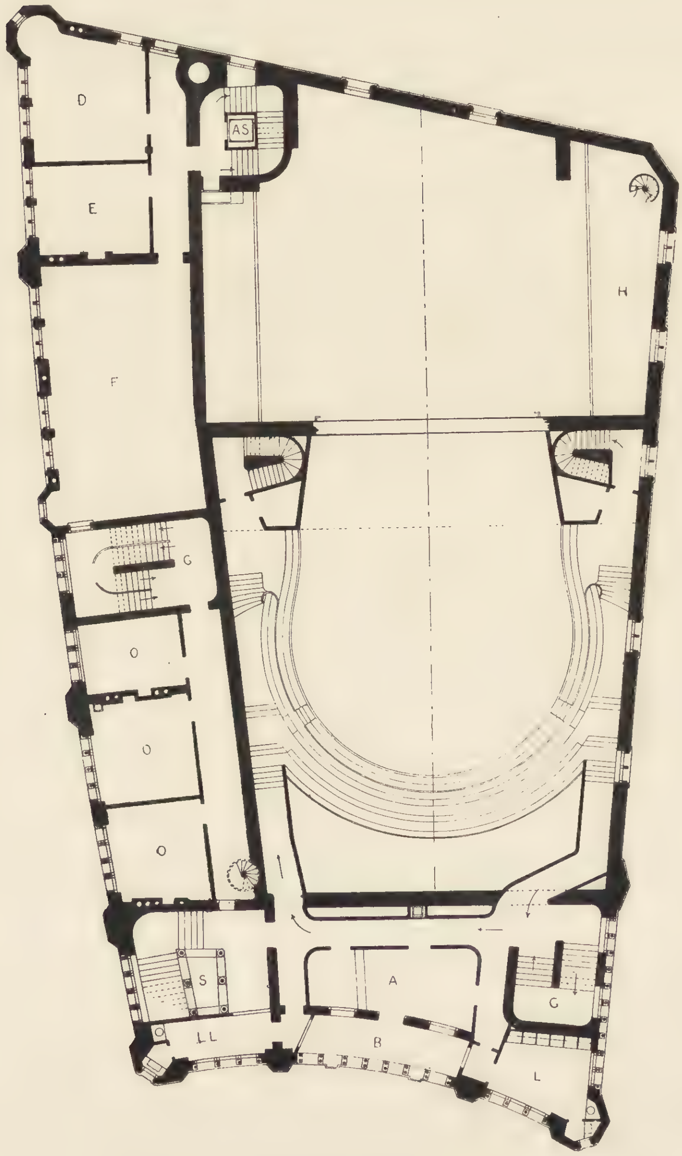

FIG. 22.—PLAN OF THIRD FLOOR (AMPHITHEATRE).

Scale of about 28 feet to one inch.

A, Amphitheatre bar. B, Open balcony. G, Gallery stairs (2). L, Gentlemen's lavatory. L L, Ladies' cloak-room. O, Offices (3). S, Grand stairs. A S, Stage stairs and lift. D, Stage wardrobe. E, Seamstresses' room. F, Ballet instruction and chorus practising room. H, First fly gallery (stage).

It will be noticed that the front rows of the circles fall towards the stage, while the back rows are gradually sloped up towards the side walls. This is to secure as good sight-lines for the side seats as for the centre ones [fig. 21].

Modern improvements in the construction of theatres demand the abolition of all columns in the auditorium; such obstructions to the sight are a constant source of annoyance to the playgoer. There are no columns supporting the three tiers of the Royal English Opera House, but steel cantilevers, probably the largest that have been used in theatre-building, which are firmly built into the back walls, and do all the required work without further support. The tiers, corridors, staircases, landings are all constructed of concrete, and the "front" of the house may be said to be as "fireproof" as any in the world.

Space will not allow me to describe the marble proscenium frame, or the decorative treatment of the private boxes, the circle fronts, or the ceiling. I must pass on to the stage and its appurtenances, where the provisions for the performers are on the most luxurious scale; where the dressing-rooms

are all amply lighted and ventilated, with hot and cold water laid on to the washing basins in each room—a luxury fully appreciated by the performers. The introduction of the lift (A S) to the floors of dressing-rooms is an excellent innovation, due to Mr. D'Oyly Carte. The ballet room F and the wardrobe rooms D E will be found on the amphitheatre level [fig. 22].

I cannot attempt in this article to describe the forest of timber which constitutes the stage, with its gridirons, double set of flies, double mezzanine, and cellar; suffice it to say that Mr. D'Oyly Carte has introduced iron construction wherever possible, and wherever he could make it compatible with the conservative usages of the stage-carpenter's law, which, strange to say, changes but little with the advance of science. Some idea of the extent of the stage may be formed when it is stated that the height from cellar to gridiron is ninety-eight feet. The stage and cellars are protected with a system of "sprinklers," in addition to the usual provision of hydrants and fire appliances. In the basement are large engine-rooms for the electric lighting and the heating apparatus.

After examining the plans of the Municipal Theatre, Amsterdam, the work of the architect, Mr. Jan Springer, I cannot help feeling that the building which I have just described is but a small affair; though, if for a moment the circumstances of each case are considered, it will be acknowledged that the Royal English Opera House is as worthy of the architect's attention as the Municipal Theatre, Amsterdam. The former undertaking was that of one man, unaided by the State, for a London audience; the latter is, I understand, the undertaking of a body of gentlemen, aided by the Municipality. In England large theatres cannot be made to pay; no manager's pocket could bear the large working expenses of such a theatre as this now being erected in Amsterdam, even if he were able to provide the capital to erect the building. Mr. Jan Springer's theatre * is, in point of fact, a municipal opera house, with the auditorium arranged with tiers of private boxes and galleries. The whole of the ground floor of the "front" of the house is occupied by approaches on a scale of magnificent grandeur [fig. 23]. Immediately under the stalls is a large circular vestibule or rotunda D, which is approached by the front entrance lobby A and entrance hall B, as well as by the two large side entrances C C, of almost equal importance to the front entrance. Right and left of the rotunda are two grand approach staircases C C, which are double, and lead up to the first mezzanine landing B [fig. 24]. One portion of each of these staircases is continued to the first floor or grand circle landing C [fig. 25]. The second mezzanine floor [fig. 26] and gallery floor [fig. 29] have two separate entrances in the front angles of the building AA, AA [fig. 23], and it will be noticed that a special arrangement of barriers conducts the audience to the pay-boxes, *a*. Fire corridors, E and E E [fig. 23], are provided as exits from the orchestra; and, on all the levels above, similar "brandgang" lead to external balconies.

* The foundation plans of this building, which rests entirely upon piles, are particularly curious and interesting. They, with others, some of which are reproduced here, are in the Library.

On the first mezzanine [fig. 24] is a tier of private boxes at the back of the pit stalls L and the orchestra stalls K. Over the front entrance is a large saloon A. The

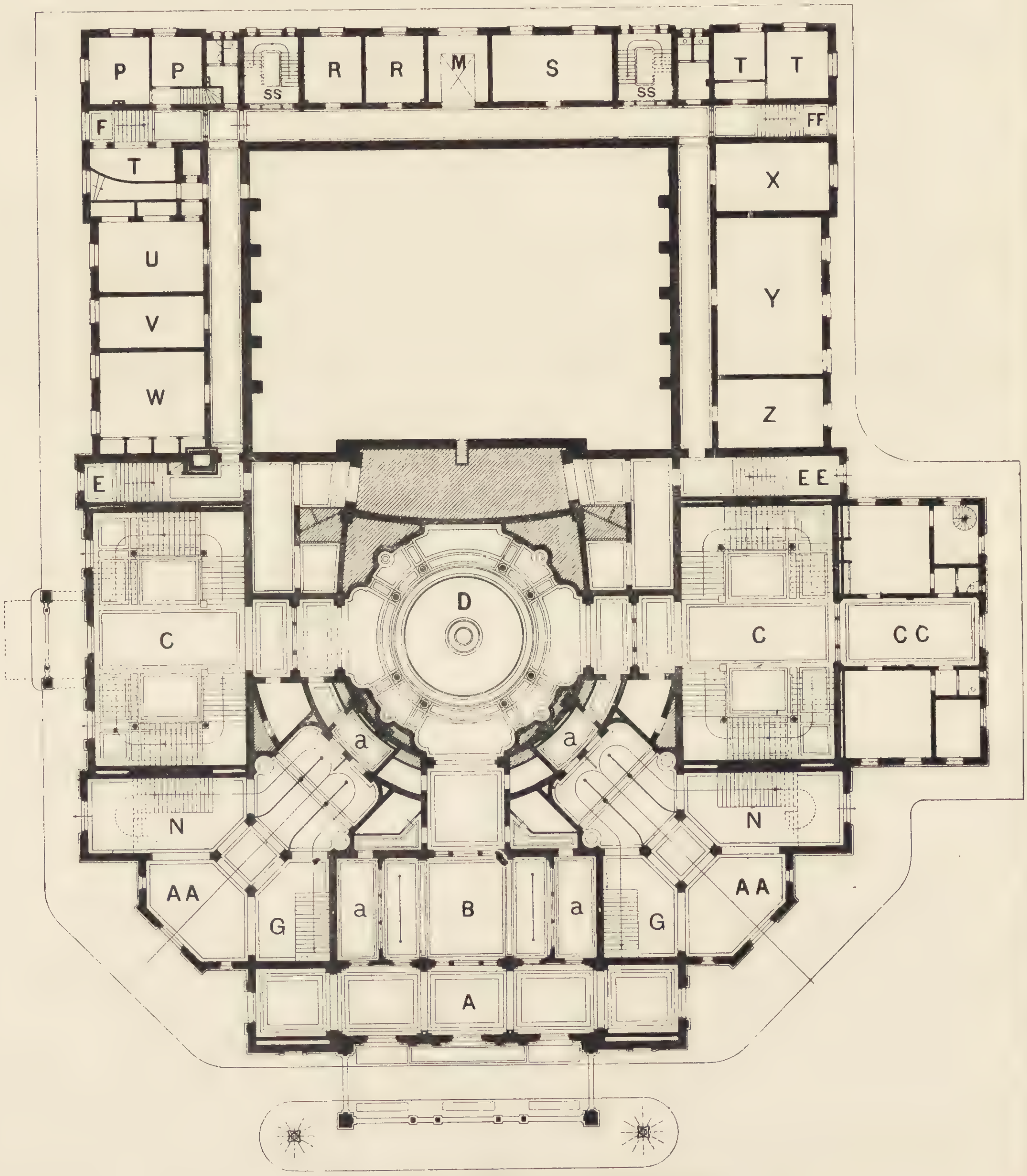

Fig. 23.—Plan of Ground or Entrance Floor.

Scale of about 33 feet to one inch.

A, Grand entrance leading to grand stairs (2), C. B, Box office lobby. C, Stairs (2) to stalls on mezzanine floor, and to grand circle on first floor. C C, Manager's set of rooms. D, Central hall. A A, Entrances (2) to second circle and gallery. G, Stairs (2) to gallery. N, Stairs (2) to second circle. *a a*, Box offices and pay offices (4). E, E E, Emergency exits from orchestra. F, F F, Stage entrances. M, Stage-lift. P, P, Residential apartment. R, Dressing-rooms (2). S, Store. *s s*, Stage stairs (2). T, T, Stage door-keepers. U, V, W, Stage administration. X, Manager. Y, Board-room. Z, Orchestra-room.

retiring rooms for gentlemen are at *e*, and for the ladies at *d*, an arrangement continued on the tiers above; C is a large buffet and smoke-room. On the grand tier [fig. 25] are two rows of balcony stalls, behind which are the grand tier private boxes and the Royal box (A). On this level is the grand saloon, of magnificent proportions, situated

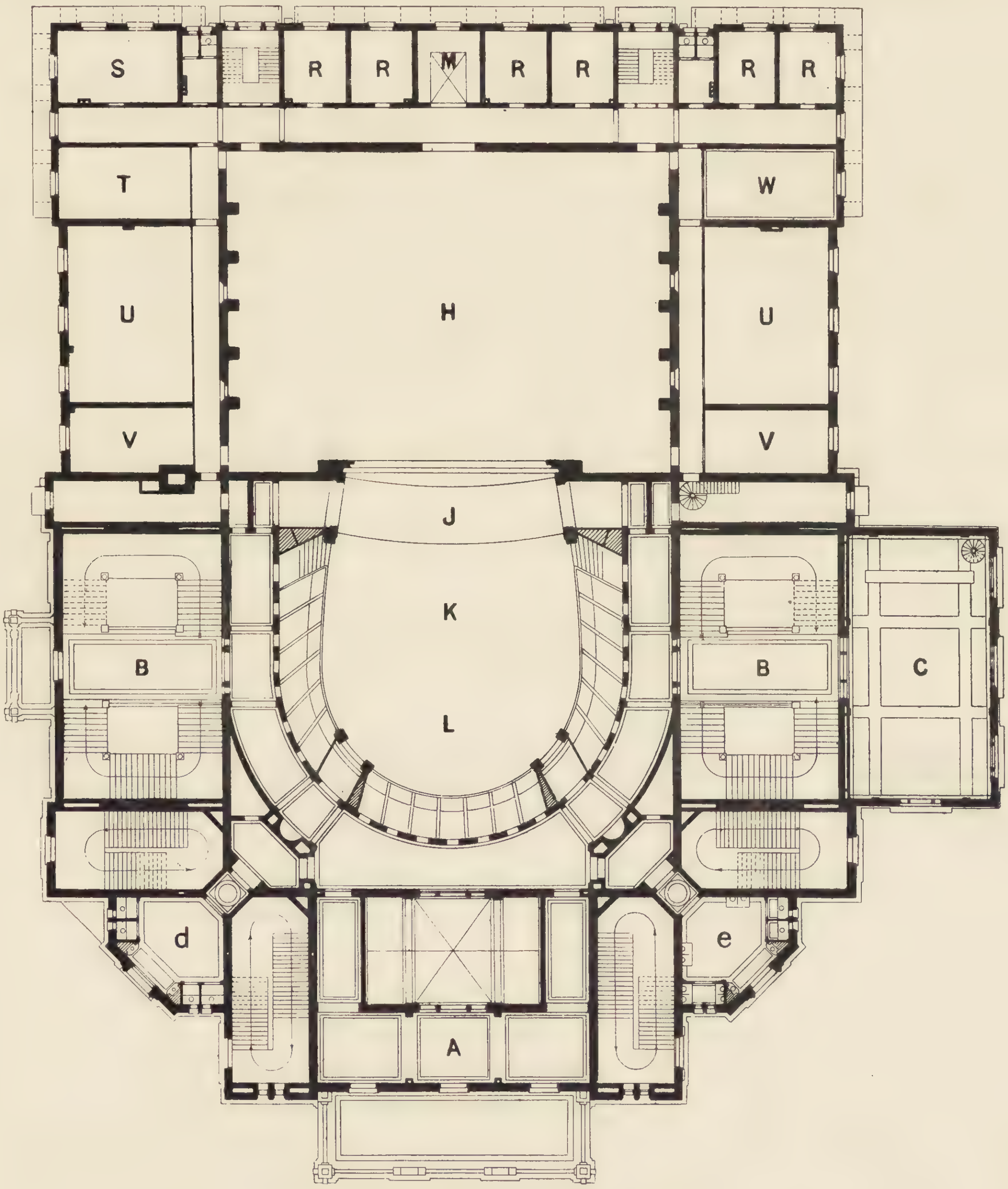

FIG. 24.—FIRST MEZZANINE FLOOR: STALLS.

Scale of about 33 feet to one inch.

A, Foyer, leading out to terrace over grand entrance portico. B, Floor landing on grand stairs (2). C, Refreshment saloon. *d*, Ladies. *e*, Gentlemen. H, Stage. J, Orchestra. K, L, Stalls. M, Stage-lift. R, Stage dressing-rooms (6). S, Store. T, Stage manager. U, Scene docks (2). V, Stage administration (2). W, Green-room.

in the front of the building. The second tier [fig. 26] is arranged entirely as balcony stalls, with the exception of two private boxes between the columns of the auditorium.

The architect of the Amsterdam Theatre has made a symmetrical plan; and he

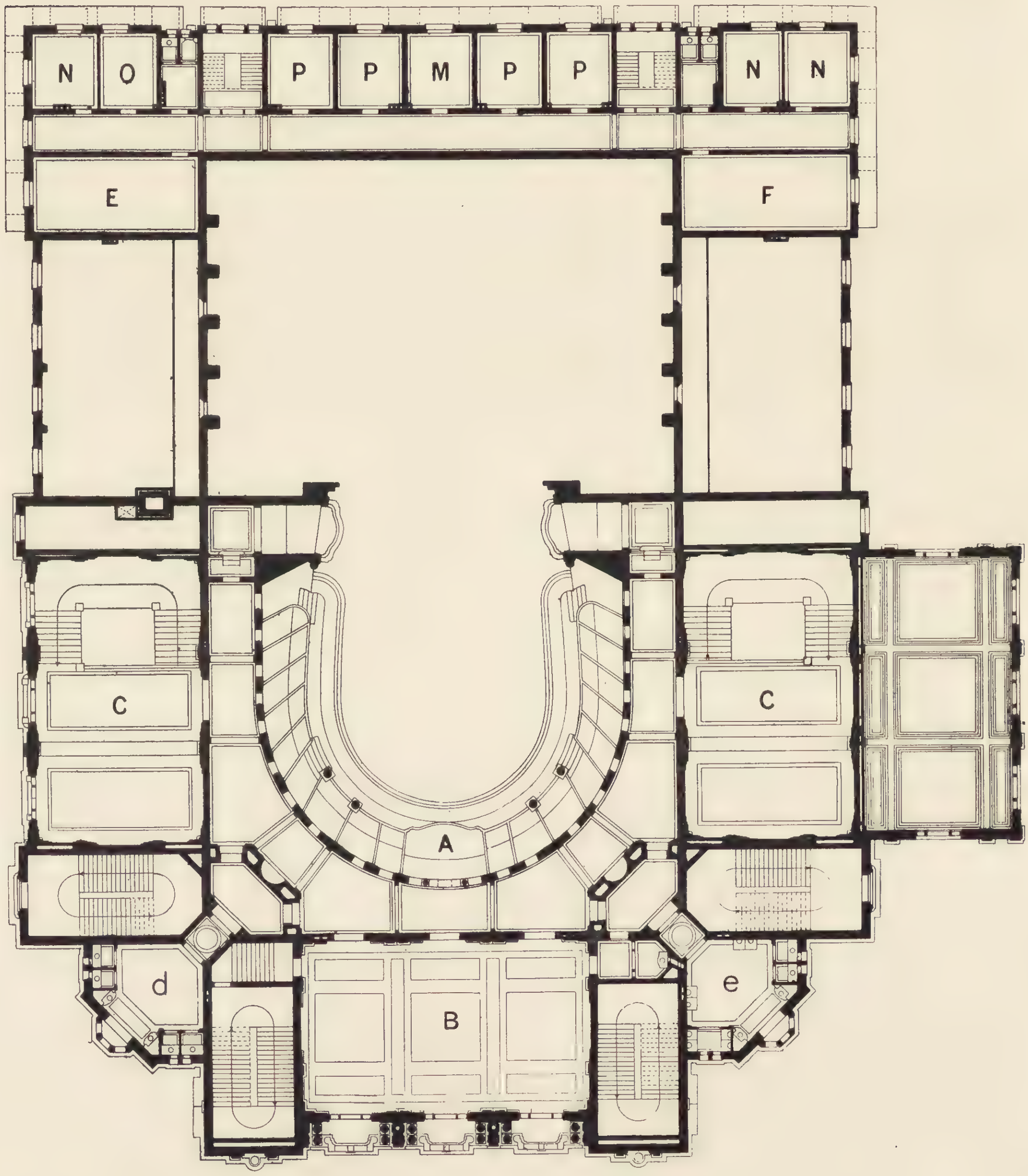

Fig. 25.—First Floor: Grand Circle.

Scale of about 33 feet to one inch.

A, Royal box. B, Grand foyer. C, Grand or first circle landing on grand stairs (2). *d*, Ladies. *e*, Gentlemen. E, Chorus dressing-room. F, Chorus dressing-room. M, N, P, Stage dressing-rooms. O, Hairdresser.

has consequently recognised the necessity of providing two exit staircases from each part of the building, and placed them in corresponding positions on either side of it.

The orchestra floor, as will be seen by the longitudinal section [fig. 27], is laid over a hollow, semicircular, inverted vault; doubtless to improve the resonant qualities of the orchestra and increase the sound produced by the instruments. The position of

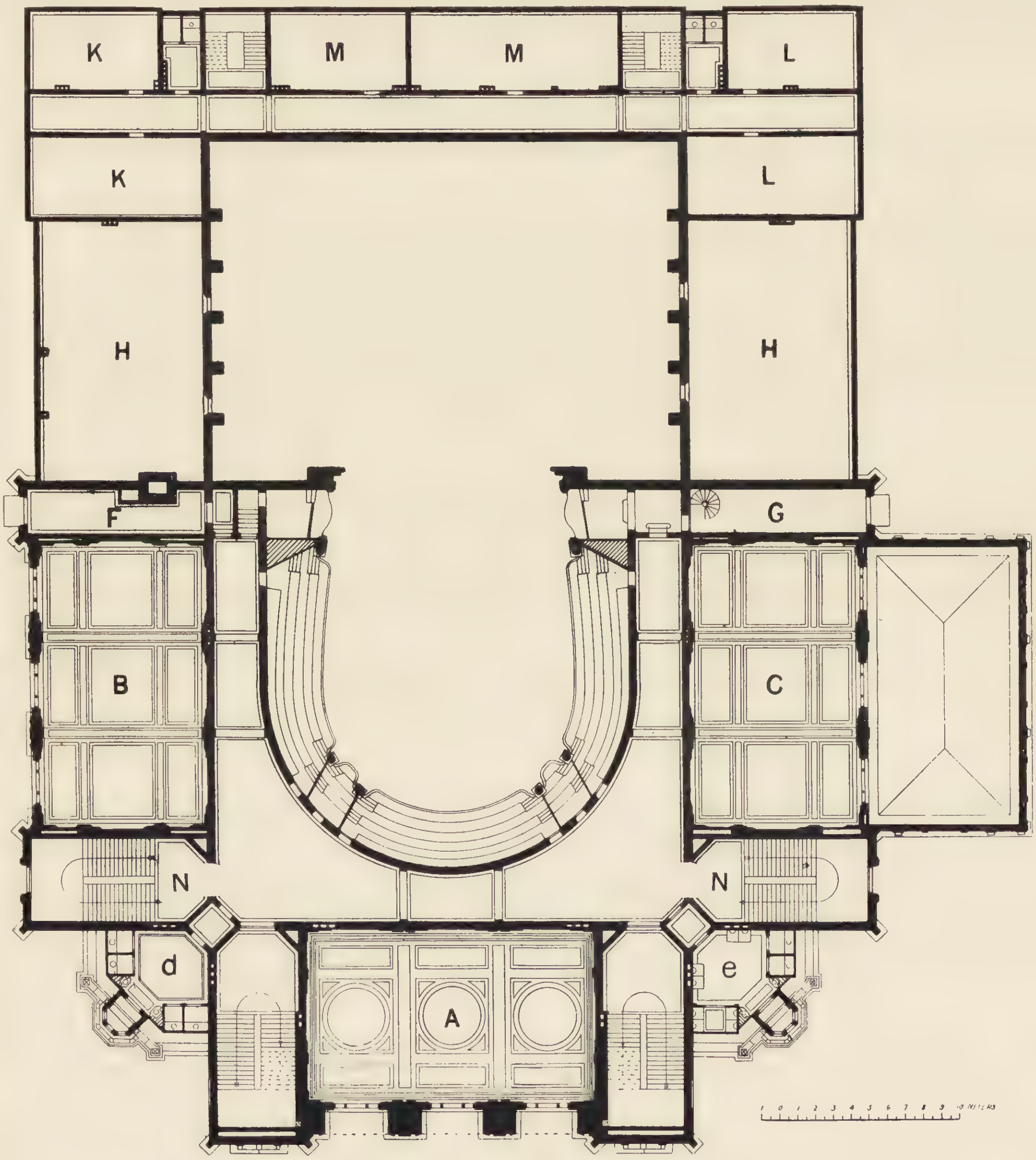

FIG. 26.—SECOND MEZZANINE FLOOR: SECOND CIRCLE.

Scale of about 33 feet to one inch.

A, Upper part of grand foyer. B, C, Upper part of grand stairs (2). *d*, Ladies. *e*, Gentlemen. F, G, Emergency exits to outside balconies. N, Stairs (2) down to entrance floor. H, Upper part of scene docks (2). K, Actors' dressing-rooms (2). L, L, Actresses' dressing-rooms (2). M, Stores (2).

the dressing-rooms for the actors and actresses in the rear of the stage is an excellent one. They are protected by being separated from the stage by a fireproof corridor and a solid brick wall; and a special feature has been made in providing outside fire-escape

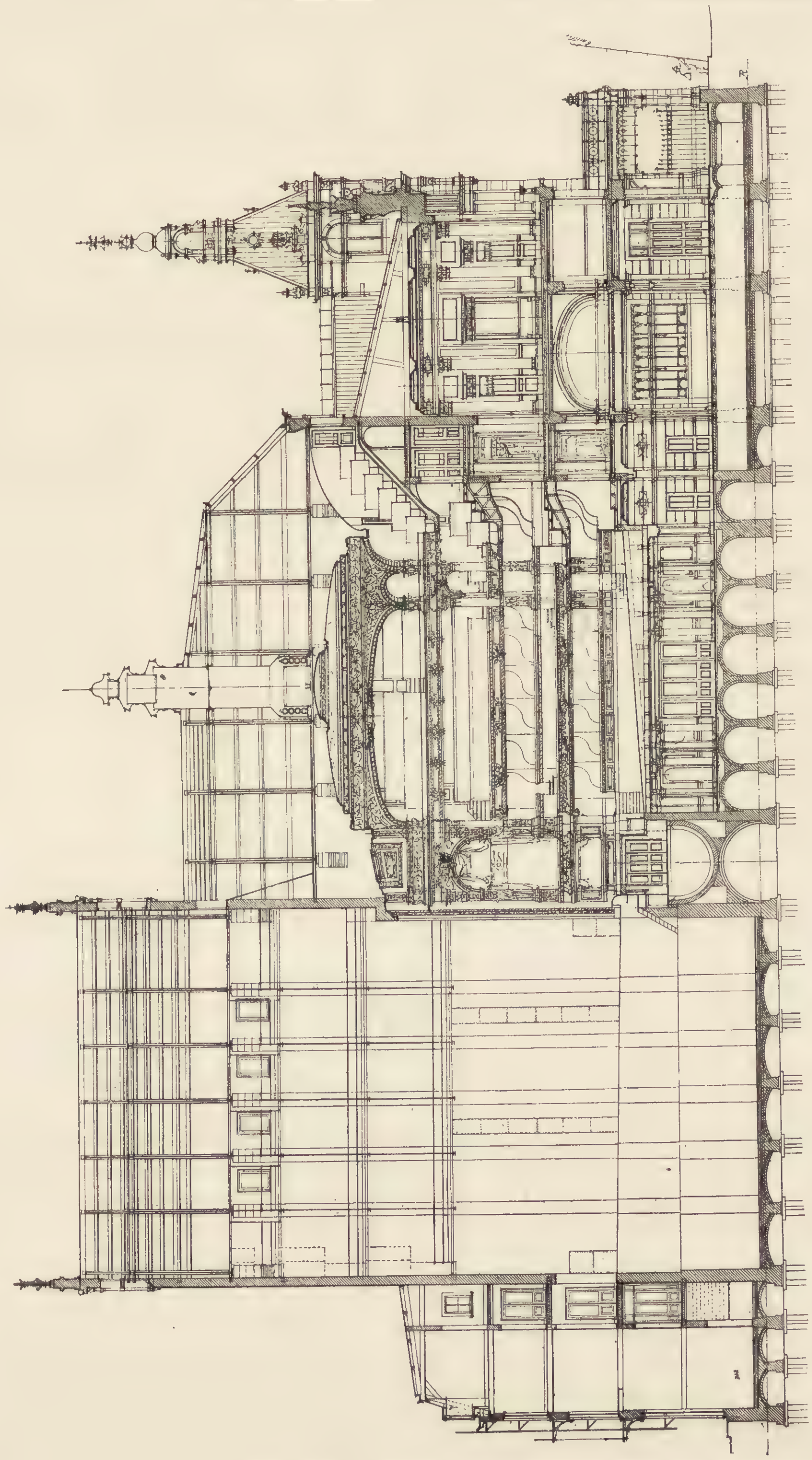

Fig. 27.—The Municipal Theatre, Amsterdam.

Longitudinal section (scale of about 30 feet to one inch).

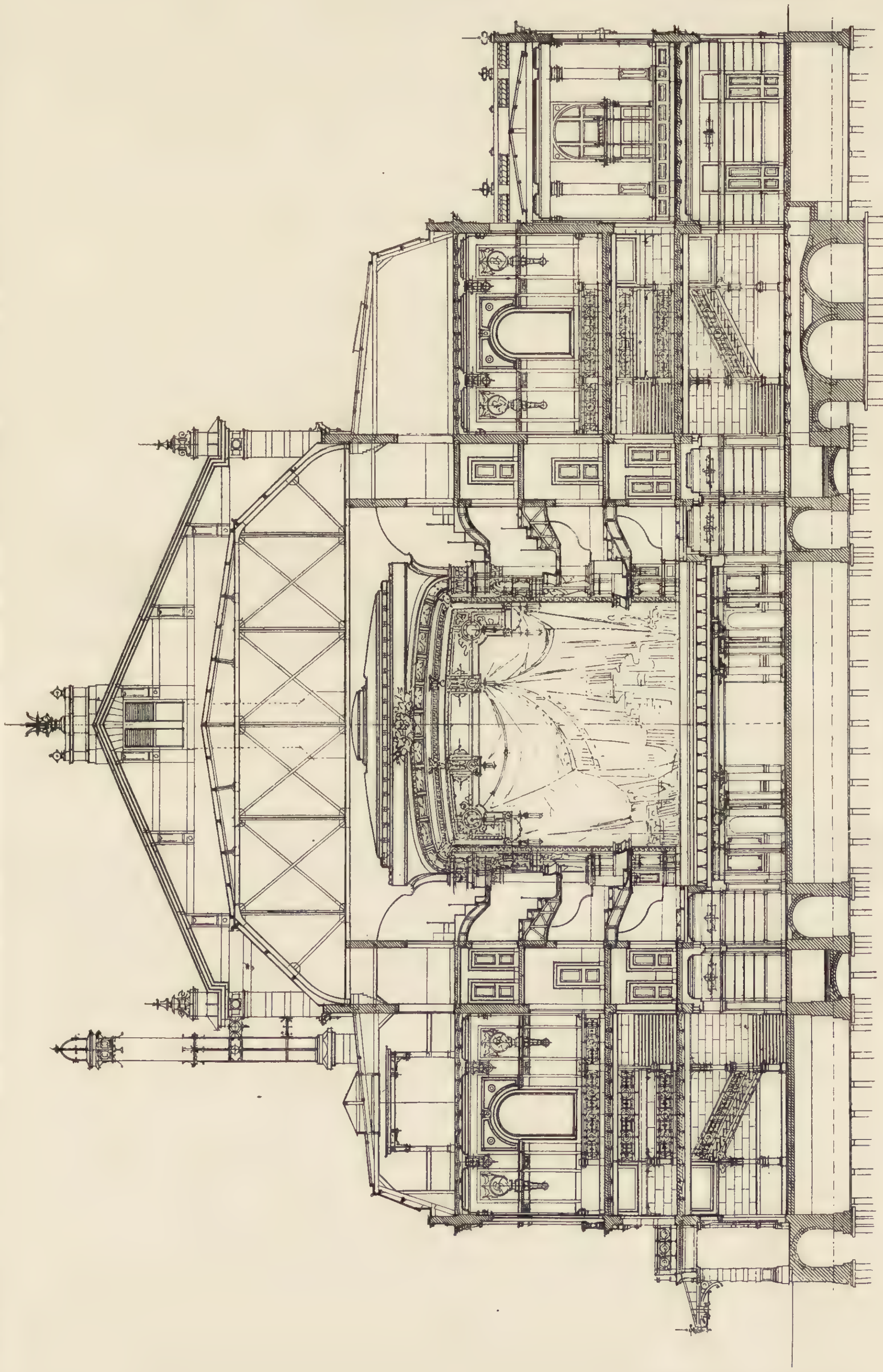

FIG. 28.—THE MUNICIPAL THEATRE, AMSTERDAM.
Transverse section (scale of about 26 feet to one inch).

balconies to the various floors of dressing-rooms. The extent of the stage can be judged by and a good idea of the construction of the building obtained from the sections [figs. 27, 28]; and though I am unable through lack of information to describe the decora-

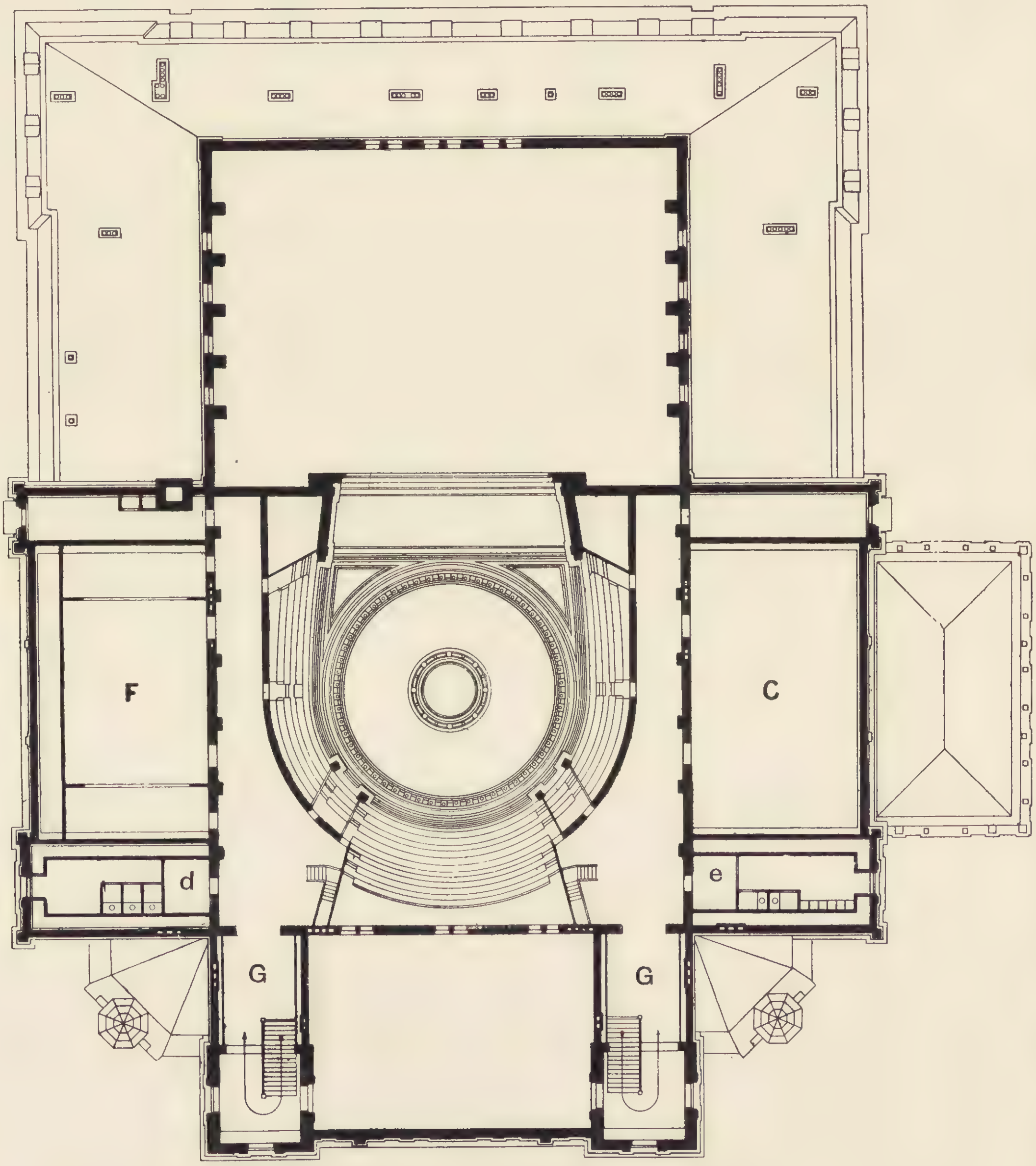

FIG. 29.—TOPMOST FLOOR: AMPHITHEATRE AND GALLERY.
Scale of about 33 feet to one inch.
C, Saloon. F, Refreshment-room. G, Stairs (2) down to entrance floor. *d*, Ladies. *e*, Gentlemen.

tive treatment of the interior, sufficient has been said to call attention to this work of Mr. Jan Springer, by whom the Institute has been presented with the drawings from which the foregoing illustrations are reduced.—ERNEST A. E. WOODROW.

XCII.

LONDON BUILDING LEGISLATION.

By Edwin T. Hall, *Fellow*.

Mr. J. Macvicar Anderson, *President*, in the Chair.

Mr. President and Gentlemen,—

It is my privilege to-night to address you on a subject than which none can be of greater interest to architects practising in London, for my theme is the laws which regulate building in this vast province—laws which have, or should have, for their object to secure that "all buildings shall be of sound construction and "arranged with due regard to the health and well-being of the persons using them, "and to their safety from fire and pestilence." The present is a propitious time for considering such a subject, for the codification and amendment of the Metropolitan Building Acts are now within the domain of practical politics. The Government have taken up the subject, and it is an open secret that they are about to introduce Bills for the purposes indicated. For the past two years the Practice Standing Committee of this Institute have been engaged on drafting in Bill form suggestions for the codification and amendment; and these suggestions,* so far as they relate to all sections describing construction, have been approved by the Council of the Institute, submitted to the President of the Local Government Board, the County Council, the Commissioners of Sewers, and other public bodies. The County Council have also, taking for text the Government Draft Consolidation Bill, prepared a series of amendments which express their views on the subject.

It will be remembered that two years ago Mr. John Slater read a valuable Paper on the subject of building legislation in London,† and I do not propose to go over the ground so ably filled by him. It was my privilege to open the discussion on that Paper, and I was able to inform the Meeting that the Practice Committee were about to consider a large number of suggestions, received in response to their invitation, for amending the Acts. To those members of the Institute who favoured us with sugges-

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* See page 127. † Transactions, Vol. VI. N.S., pp. 115–137.

tions, or drew attention to amendments they thought necessary, the Institute owes its thanks; and particularly I would wish to mention our Fellow, Mr. S. Flint Clarkson, the District Surveyor, who sent us a valuable list, and who as a member of our sub-committee rendered most valuable aid. The Committee were engaged for a year and a half in the task of codifying the Acts, collating and considering the amendments, and their draft was considered subsequently by the Council. The Committee, as you know, contain five or six District Surveyors, and it had been the wish and intention of the Committee to confer with the District Surveyors' Association, as a corporate body; but the Local Government Board asked to have the Council's views by a given date, and there was not time to carry out the Committee's wish.

When the constitution of the Committee and Council are considered, I think it will not be out of place to point out that the suggestions now under discussion embody the views of men of large and varied experience in the working and administration of the Acts, all of whom are technical men, and capable of measuring the meaning and effect of the various sections.

To avoid misunderstanding, I wish to say that the printed document does not pretend to be a Bill drawn in legal form. It professes only to embody the matter (put, we hope, in unambiguous and technical language) which should be framed by the legal draftsman into a Bill.

Before coming to the actual subject-matter of the suggestions, I have first to say that the Committee laid down, and were guided throughout their work by, the principle that in undertaking to submit suggestions for a draft public Bill they were bound to approach the task in a public spirit; that they had not to consider how they could rid themselves of restrictions which to artists are often galling, but how they could, as technical advisers of the public, guide them so as to ensure safe and sanitary building, imposing as few as possible restrictions on artistic design, and removing such restrictions where not required to attain safety and sanitation. Starting with this fundamental principle, it became necessary in the actual framing of the draft to lay down subsidiary principles. The first is,—

1. It is suggested that the details of construction, which are subject to variation from time to time by reason of, *inter alia*, new inventions, new materials, or modes of construction, &c., should be omitted from the body of the new Act, and be placed in schedules attached thereto, power being given by the Act to the County Council and to the Commissioners of Sewers, as the case may be (subject to provisions corresponding to those of Part II. of the Metropolitan Management and Building Acts Amendment Act 1878), to vary these as occasion shall require, the object being to allow of changes in details of construction without the necessity of going to Parliament.

As to No. 1, I think the soundness of this view is so obvious that it will be unnecessary for me to dilate on it.

Another principle was—

2. That the new Act should be confined to and extend to everything within and enclosing the curtilage of a building, including any vaults under a public way; it is

also suggested that it should include sanitation (*i.e.* drainage, air spaces, ventilation, plumbing, &c.) and regulations respecting lines of frontage of buildings.

3. The construction of roads, sewers, and bridges, and of everything in the nature of public thoroughfares for use in common by the public, to be excluded.

As to No. 3, were it not that this last principle was contested by one or two members of the Institute in 1890, I should pass it by without further comment. But it is an important principle which the Committee and Council have adopted. Streets, sewers, bridges, embankments, and open spaces, being for use in common by the public, differ essentially from buildings for the limited use of those to whom they belong or their nominees. As I said in 1890, "surely the legislation with regard to buildings "is sufficiently wide in its scope and has sufficient interests to deal with to make it "advisable to keep an Act for these alone."

Next are—

4. Rights of light and air to be excluded, as they are in the nature of private property.

5. Restrictions on design, which are questions of taste, to be excluded.

As to the order in which it is suggested the new Bill should be framed. Speaking generally, the Committee have adopted that of the 1855 Act, believing that to be more convenient than any other arrangement, and one to which the public is habituated. Coming to detail, the Committee have given great attention to definitions. Probably no one cause could be named giving rise to more trouble and friction than the lack of clear definition in an Act. The Committee have had before them, in framing their definitions, the Act of 1844, all the Acts now in force, the Bills of 1870 and 1874, the Model By-Laws and the By-Laws of other large cities. Their object has been to avoid ambiguity.

The following subjects defined by the Committee are not defined in the existing Building Acts:—Building, structure, wall-sign, warehouse, domestic building, living-room, flat, business offices, storey, topmost storey, floor area, superficies, cubic contents, fire-resisting.

New definitions are given of public building, site, base of the wall, foundation, builder, street (instead of roadway), and centre of street. The definitions of sky-signs, habitable room, and underground room have been taken from the Sky-Sign Act of 1891 and the Public Health London Act, 1891, respectively, but the "underground" definition has been extended to embrace "living rooms."

Throughout the suggested Act, *area* means a horizontal measurement; *superficies*, a vertical or sloping one.

The subdivision of the Act into parts has been abandoned, as such division serves no useful purpose, and adds to the length of any reference. A plain consecutive numbering of sections is all that is wanted.

Under the head of "Exemptions to the Act" it is suggested that the building popularly known as the Bank of England, *i.e.* the central office, shall be exempted; but not any branch erected in any other part of the metropolis. It is manifestly

opposed to the public interests protected by these Acts that the branches of the Bank now being erected in many parts of London should be free of restrictions binding on the London and Westminster, and every other rival institution.

In like manner, the exemption of buildings vested in the Commissioners of Greenwich Hospital should be confined to those "used for the purposes of the said "hospital." It is not desirable that the mere purchase of a shop or other premises as an investment by, or the bequest of a shop to, the Commissioners should, *ipso facto*, release it from the control of the Building Act.

The Committee also feel that the exemption of buildings belonging to a canal, dock, or railway company should not only be subject to a similar limitation, but that the exemption should only extend to buildings at such a distance "from any street or "from any building or ground not belonging to the company" as shall minimize the danger that would arise were a combustible station on fire. For example, Moorgate Street Station, in the heart of the City, is entirely built of wood.

It is suggested that buildings in the Inner and Middle Temple, Lincoln's Inn, Gray's Inn, Staples Inn, Furnival's Inn, or the Close of the Collegiate Church of St. Peter, Westminster be no longer exempted. If the principle of the Act be sound, and its enactments be just in the public interest, for a house in Holborn, they are equally just and necessary for a house in Furnival's Inn. The Committee are aware that any interference with vested interests, even if they be in the shape of immunities, is liable to evoke opposition; but they feel that the governing bodies of the various institutions affected have no desire to allow or perpetuate exemptions inimical to such public interests as the prevention of fire and pestilence.

The exempting clause of buildings not exceeding in height 30 ft., &c., has been added to, so that it may not be abused in the erection of the pioneer houses on a new estate in process of development.

New exemptions are (1) small buildings in back yards, such as fowl houses, bicycle sheds, and kindred structures limited in size, at prescribed minimum distances from other buildings, and not containing apparatus likely to cause fires; (2) fences not built of fire-resisting materials; (3) window-openings existing previous to the passing of this Act, in any wall the lower part of which is used for the separation of any buildings, so long as they remain windows external to any adjoining building; (4) wall-signs of limited size over private property not used as a thoroughfare.

With respect to the exemption of the "necessary woodwork" of a greenhouse, a limit is set on the size of a greenhouse *attached to a building*, to which such exemption may apply.

The exemption of "openings made into walls or flues for the purpose of inserting "ventilators," &c., is qualified to the extent that thereby "no opening shall be made "from one building to another through any walls separating buildings."

The Committee further consider that a large number of erections which are not buildings should be exempted from the general provisions of the Act; but should be subject to control or supervision by District Surveyors.

The most important of these, in respect of which the new sections impose strictly defined limitations and restrictions, are (*a*) " private bridges to connect buildings " ; (*b*) " glass and iron roofs over open yards " ; (*c*) open buildings (*i.e.* sheds) in builders' and other yards, and (*d*) external metal flue-pipes exceeding a certain length. At present it has been contended that a covered and enclosed bridge between two warehouses in the same occupation is a separate building, involving brick walls, double iron doors at both ends, &c.

With regard to the exemption of wooden structures required on works by builders during the construction, say, of a building, the Committee have added machinery for compulsory removal of the structures at completion, which does not now exist in the Acts.

An important addition to the Act is the section dealing with the " alteration in " purpose or character of a building." The necessity for this has been on more than one occasion urged in this room, and, I believe, felt by the Building Acts officials. It is as follows :—

" Any building, erection, or structure, in any respect exempt from the operation " of this Act, or in any way privileged in respect of any provision of this Act, shall " remain so exempt or privileged so long only as it is used for the purpose or retains the " character, or is converted to a use, purpose, or character by reason whereof it is or " would be so exempt or privileged ; and forthwith on its ceasing to be so exempt or " privileged, or on its being converted to a use, purpose, or character other than one " exempt or privileged as aforesaid, it shall become subject to the provisions of this " Act applicable to its new use, purpose, or character, and shall be altered to conform " in all respects to the requirements of this Act ; or should its use, purpose, or " character, by reason of which it was privileged but not exempt, be changed to such " other use, purpose, or character as will entitle it to other and different privileges, " then its original privileges shall cease, and in respect thereof it shall be altered to " conform to the requirements of this Act."

A new section also provides for the restoration of buildings of architectural, archæological, or historical interest, by which it is sought to enable such buildings to be restored or maintained in their original character ; and the same power is given for the restoration of any building " constructed with the written consent of the Metro- " politan Board of Works or the Council, otherwise than in accordance with the Act." For example, a half-timbered house constructed by consent as aforesaid on Streatham Common may, if burnt down, be restored in its original design.

The section for " rebuilding old buildings " is varied. Now more than one-half must be taken down before the authorities can insist on the taking down and rebuilding of the whole to conform to the Act. It is proposed that, with the before-mentioned exceptions, whenever the roof of any one-storeyed building has been taken down or *destroyed,* the whole of the building shall be made to conform to the Act. In all other buildings, if more than half has been taken down or *destroyed,* " the portion " to be rebuilt shall be so rebuilt in conformity " with the Act, and every other por-

tion shall be made to conform to the Act, not necessarily by taking down as now required.

Coming to foundations and sites of buildings, the proposed section says that the concrete used for covering the floor area shall be made with cement, but other materials may be used as defined by by-laws.

The enclosing walls of a building, it is suggested, may rest on the ground, or "upon a bressummer of fire-resisting material, or upon other solid substructure." This is meant to get over the present difficulty in which the district surveyor finds himself when an external wall rests on a girder over a shop front, or where the external walls of various superimposed storeys are in different planes to make way for the angles of ancient light of a dominant tenement opposite the wall in question.

The present rule as to the thickness of concrete under a wall is manifestly inadequate. A speculator-builder complies with the Act by putting a building 90 feet high (maybe on a boggy site) upon "good concrete" 9½ inches thick. The suggested section says the thickness shall vary according to the height and class of building. It allows of the omission of concrete, with the approval of the district surveyor, where the site is "a natural bed of solid gravel or chalk of not less than "three feet in thickness."

Here it may not be out of place to remark that, when the schedules for walls and concrete come to be considered, a point that ought not to be overlooked is the strength of piers on which, by girders or otherwise, a load is concentrated. In such a case the sectional area of the pier should be such that no greater load than a specified number of tons per square foot should be thrown upon it; and, in like manner, the area of concrete should be such that the load on the earth beneath shall not exceed so much per square foot of bearing surface. From ten to fifteen tons has been suggested in the former case, and from two to five tons in the latter.

The old Section 17 of the 1878 Act, which prescribes the mode of preventing the erection of a building contrary to the Act, is retained, but it is proposed to expedite the procedure by requiring compliance with the district surveyor's notice within seven instead of twenty-eight days.

A new section proposes to provide a schedule of thickness for fence walls.

The subject of recesses and openings in walls has received careful attention, and I ask your consideration of the changes introduced.

First as to those in external walls. It is not necessary in an assembly of architects to speak of the inconvenience that all have felt under the old Section 13, Subsection 2 of the 1855 Act, which requires that the recesses and openings together shall not exceed one-half of the area of the wall in which they are made. For example, if a shop consist of basement, ground, first, and second floors of equal height, and the exigencies of trade in London require that practically the whole of the ground floor in front be window, and the front wall of the basement be omitted to get light from the pavement or to throw the storey open to the vaults made under the footway, a compliance with the section would forbid any windows in the front wall of the first or

second floors at all. Until recently it has been an almost universal custom for the district surveyor to ignore the section as impracticable. Where that has not been done such expedients have been resorted to as carrying down the front wall far below the ground, and occasionally far above the topmost storey, to get a sufficient area of wall to enable windows to be made on the first and second floors in the cited example.

Manifestly such evasions are, to say the least, undesirable. But the exigencies of trade, and, more than that, the sanitary necessity for providing access for light and air into large buildings, be they shops, warehouses, or offices, are so paramount that building law should be made to accommodate itself to the necessity. It is therefore proposed to modify the law by enacting that the recesses and openings *in any storey* shall not "exceed one-half of the superficies of the wall of such storey in which they "are made," thus leaving each upper storey secure in the possession of a provision for adequate light. But the new section says the aforesaid limit "shall not apply "to that portion of an external wall between its base and thirty feet above the "level of the public footway immediately in front of the centre of the façade; or "where there is no such footway, then above the actual level of the ground before "excavation."

It is submitted that this proviso for the non-application of the restricting clause is reasonable. Architecturally it permits a more free and lofty treatment of the ground and first floors of buildings, by grouping them under one arch, or otherwise, as taste may direct.

Turning to party walls, I must preface my remarks on recesses by saying that a principle has been adopted for fire prevention and stability which it is hoped will commend itself to all. Of course, under the existing Building Acts, the theory of the rights in a party wall is that, speaking generally, the whole of it is the joint property of the owners on both sides, not one half belonging to the owner on one side and the other half to the owner on the other side. The legal ownership of the wall is often more complicated; but that is a wide subject, and we are discussing the Building Acts. In this party wall, flues from either building are frequently ranged indiscriminately in a row, extending in upper storeys often the whole length of the wall, with only four inches between them and the respective faces of the wall. It is not possible for the owner of one building to know or control the use which his neighbour may make of the flues from fireplaces in the adjoining building. One or more of these may become dangerously heated, and may set light to inflammable material stored against the wall forming the enclosure to the flues.

The theory of ownership in the present Acts is not interfered with, but the new principle of construction is that there shall be in the centre of the new party wall a continuous backbone of brickwork, the thickness of which neither owner shall diminish. On its own side only of this backbone can the flues of any building be placed. Over these the owner of the building has control, and precautions can be taken to guard against the danger from fire arising from one of his own flues known to be liable to be overheated. Applying the principle, it is proposed that "in no case shall the back of a

"recess be within four inches of the centre of the wall." When I come to chimneys and flues, I will show what provision is made for modifying the rule where its necessity for strength and fire-prevention is non-existent. I have called this a new principle, but, as a fact, it is to be found in the 1855 Act, section 15, where we find the ends of a bressummer "shall not be placed nearer to the centre line of the party wall than four "and a half inches," and in section 18 is a similar provision regarding chases.

As to the formation and superficial limits of recesses in party walls, it will be remembered that the existing section requires every recess to be arched over, and that "the *area* of such recesses shall not, taken together, exceed one-half of the whole area "of the wall of the storey in which they are made." Now, although the intention is, the Committee think, clear that the arching over shall be in each storey, it is not expressed in words, and under the section a recess may be made practically the whole length of the party wall by the simple expedient of keeping its cill up a few feet from the floor, or its head half-way down from the ceiling. Recesses so constructed are a source of weakness to the wall, and consequently of structural danger, and, the Committee think, were never contemplated. The new section provides that the recesses should be arched, *or corbelled* over, in the height of the storey in which they are made, and that their extent shall be measured by *width*, not area, and that "the *width* shall "not exceed one-half the whole *length* of the wall of the storey in which they are "made."

This ensures at least one half of the length of the wall being of the minimum thickness prescribed in the schedule, and carries out what was doubtless the intention of the framers of the 1855 Act. Where a recess is used for the vertical passage of a lift the arches or corbels may be omitted.

The County Council in their suggestions specify the minimum thickness of the arch, and this is a good point.

As to the section governing uniting buildings, the Committee suggest a discretion to the County Council to consent to the uniting of buildings which are not *wholly* in the same occupation. In the case of floors of fire-resisting materials, such uniting of one or more floors of two buildings may, within limits, be permitted with perfect propriety.

At present section 28, sub-section 3, of the 1855 Act only forbids openings in *party walls* dividing buildings. The new section forbids them in "any party wall or "*in any two external walls* dividing buildings," an addition to prevent an evasion of the intention of the Act. It also provides that "no opening in such wall or walls on "any one floor" shall be "nearer than 25 ft. to any other opening on the same floor." At present the iron doors may be practically about eight-ninths of the whole length of the wall, *i.e.* the whole length, less, say, 9 in. piers of separation. As to the doors themselves, it is suggested that each door on one side of a wall shall be at a distance from the door on the other side of not less than 18 in., as such a distance is thought to be the least that is safe to retard a fire. Formal leave is also given for making sliding doors where they are more convenient than folding ones. At present these are

not allowable under a strict rendering of the present Act, although common sense has allowed them. It is, however, recognised that a sliding door should overlap the wall at each side and above the opening at least six inches, and this is added to the enactment.

Leave is also added to make the necessary holes in party walls for "gas, water, "steam, or other pipes, or for shafting or electric wires."

The present section requiring openings in party or other dividing walls to be stopped up has been made much stronger. It now reads: "Whenever any build-"ings which have been united cease to be in the same occupation, or wherever the "conditions under which consent as aforesaid has been given for buildings not in the "same occupation have been varied, then notice shall be given by the owner of such "building to the district surveyor, and any openings made in the party or other walls "dividing the said buildings shall be stopped up with brick or other fire-resisting "material of the full thickness of the wall itself, and properly bonded therewith; and "the said dividing walls shall in all respects be restored to the condition in which they "were prior to the uniting of the buildings.

"Notice of cessation of such occupation shall be given to the district surveyor, "and failing this, or failing to stop up the opening and restore the said dividing wall, "shall render the owner liable to a penalty. Provided always that the Council shall "have power to except any building from the operation of this section or any part "thereof."

Under the heading of "Miscellaneous" an effort has been made to get rid of the public danger arising from advertisements on combustible hoardings "on the face or "in front of the external wall of any finished building." It is prescribed that in future all "frames, tablets, plates, or other constructions shall be of fire-resisting "material throughout, securely erected in accordance with by-laws to be made by the "Council"; and the important sanitary addition is made "that no such advertisement "shall be fixed to diminish the access of light to any habitable room."

The London Sky-Signs Act, 1891, is incorporated, as it is one essentially affecting buildings.

We next come to "Timber in External Walls." It will be remembered that at present only loophole frames, bressummers, and storey posts under the same, and frames of doors and windows of shops, on the ground-floor storey of any building are permitted to be nearer than 4 inches to the external face of such walls, and the loophole frames are intended to be kept back 1½ inch. The Committee's section allows "loophole frames and all door frames, and doors of stables and coach-houses," to be fixed flush with the external face, and while retaining the 4-in. recess where it is required at present for other woodwork, allows the 4 inches to be measured not from the face of the external wall only, but from the external face of any "portico, verandah, or other "projection beyond" the building; and they add that the frame so set back shall be "in a rebate formed outside such wood in the material of which such wall is built."

The Committee were desirous of doing away with the 4-in. rule altogether, but as

its reason for being inserted in the 1844 Act was stated to be to prevent the danger that arose from flush frames falling out on to the firemen, they thought, having regard to jerrybuilding, it was right to retain it. It is, however, a pleasure to note that the County Council in their suggestions have taken power to themselves to exempt from the operation of the 4-in. rule "woodwork in oak or teak or other "approved hard wood, provided such woodwork be constructed to the satisfaction of "the district surveyor." I think this a happy idea. The jerrybuilder will not go in for expensive work like this, and the district surveyor will doubtless see that all flush frames are properly cramped to the walls. It is understood that Sir Eyre Shaw has approved this power of exemption. The only alteration I would suggest is that the word "solid" should precede "woodwork."

In the rules as to bressummers, the most important variation is that when a bressummer is of iron, steel, or bronze, it need not be kept 4 inches from the centre of the party wall. Templates and transverse ties are also specified for bressummers, and it is suggested that "all woodposts or bressummers carrying walls" are "to be "coated with fire-resisting material" as defined.

The party-wall backbone principle is brought into force regarding beams, joists, and the heads and sills of wood partitions. No other timber, with the exception of slips or plugs for fixing woodwork, is to be built into a party wall at all, and no bond timber except wall plates is to be allowed in external or cross walls.

Next the Bill deals with the height of party walls above roofs, *i.e.* parapets. These are proposed to be of the thickness required by the schedule for the topmost storey of the building; their height for warehouses and public buildings is to be at least 3 feet, and in other buildings at least 15 inches, the latter being now the requirement for all buildings.

We now come to an important addition. By this it is intended to exempt from the necessity of a parapet a party wall where, stated shortly, the higher of two buildings is 10 feet above the lower building; "or if such wall forms the enclosure to a detached "building against which the adjoining owner shall, on being so required by the building "owner, state in writing that he does not contemplate building to within the 10 feet." If the 10 feet be diminished the exemption ceases.

It may be objected, and with reason, that the necessity for getting the consent from an adjoining owner is a danger which will render the section, so far as it is an enabling one, nugatory. I fear this is so, and I think the omission of that part of the section will in no way be prejudicial to the remainder or injurious to the public. Now it will be noted that this clause admits in principle that a party wall extends from its base to above the roof of the higher of the two buildings which it separates. This reading of the existing Act has been often a subject of contention. On the one hand, it has been argued that a party wall ceases where it ceases to be a separation of *two* buildings, *i.e.* above the roof of the lower; and a decision in what is known as the Bristol case, given, not on the Metropolitan Act, but on a local by-law somewhat similar, when the above contention was upheld, has been in practice

adopted by many London district surveyors. *Per contra,* the section requiring the parapet to be above the "higher building" has been cited as implying that the wall which separates two adjoining buildings respectively, say one and six storeys high, is a party wall to above the six-storey building.

The Committee hold, not that the latter construction is a correct reading of the existing law, but that in a new Act it is the better principle to affirm from the point of view of their preamble; but they think the concession regarding the parapet a reasonable and moderate one, while its omission would in some new buildings work great hardship. Take the case of an existing two-storeyed building, with each storey of the minimum height required, situated in a valuable part of London. It has no parapet, and there is no other building against it, except a low shed, maybe a w.c. Ancient rights of light have been acquired over the two-storeyed building. It has to be rebuilt owing to the dominant rights of light. The insistence on a parapet will necessitate the omission of one of the two storeys, or a sacrifice of half the owner's property! This is one of the grounds on which I venture to submit that the omission of the parapet should not depend on the goodwill of a neighbour.

The Committee are of opinion that the party wall should not extend laterally beyond the shorter of the two buildings which it in part separates.

It may be here convenient to follow out the consequences of the admission of the height principle. Under this no one can make a new window in the party wall overlooking his neighbour's roof, a source of great danger in the spread of fire. This prohibition also enables the adjoining owner to at any time have his full enjoyment of his right to raise his building and to use the party wall for its full height.

Under a later part of the Act, regarding the payment of the cost of party walls, which the Committee have not yet reported on, it is intended to suggest that the adjoining owners shall from time to time pay to the building owner his share of the cost of such part of the wall as he may from time to time make use of. This will remedy the present injustice, as laid down in a recent decision under the Building Act, that if one man builds a high and expensive wall, and the adjoining owner at any time after the completion of the wall raises his building and uses the new wall, he is not bound to pay a penny of its cost, because the wall was not built at his request.

Passing from this subject, it is next proposed that the party wall shall be corbelled out to the full extent of projecting eaves, verges, barge boards, and cornices not constructed of fire-resisting material, to the height and thickness required for parapets.

Projecting eaves, verges, barge boards, and cornices of detached domestic buildings of classes A and B (*i.e.* of ordinary suburban houses and stables) are proposed to be permitted to be of wood, and the soffits of the eaves and verges may also be of wood coated with fire-resisting material, provided that the buildings are ten feet from any other building or ground outside the curtilage of the building; a pair of semi-detached houses being treated as one detached house.

The old maximum angle of 47 degrees for a warehouse roof has been abandoned. Now it is suggested that a maximum angle of 80 degrees shall apply to all roofs next

to external or party walls. Incidentally this will prevent a not infrequent evasion of another part of the Act. Cases have occurred where a building owner, not wishing to put a brick wall to enclose his house, has put the enclosure slightly out of the vertical and called it a roof.

A new clause requires an "efficient guard made of fire-resisting material" to prevent roof coverings, such as slates and tiles, falling into the street where there is no parapet to a building "abutting on or within four feet of a street."

Storeys in roofs are proposed to be limited to two for domestic buildings and one for warehouses. In buildings of the maximum height this is already the law under the General Powers Act of 1890, and it is a sound limit for the protection of life.

A new section for "chimney shafts" from furnaces incorporates the essentials of the present rules which the Council Council adopt in sanctioning such shafts. These the County Council have in their amendments also incorporated; but by the prefix of the word "detached" they have—I think, unintentionally—excluded a very large number of shafts, and the limitation to the furnace of a steam-engine, brewery, distillery, or manufactory is undesirable. There have been many disputes and law-suits over what is included in the term "manufactory," and the Committee have inserted in their section "mill, factory, and printing works," in addition to brewery, distillery, and manufactory, as more comprehensive. The words "steam engine" are undesirable again, as they are restrictive. The Committee's section omits battering or tapering as an essential.

In the rules as to other chimneys and flues many other variations in detail have been made by the Committee, but it would take too long to specify them all. They are practically all addressed to avoiding the spread of fire.

Applying the backbone principle of the party wall, the new sub-section requires that the back of a flue shall not come within two inches of the centre of the wall "for any "part of its height below the top of the topmost storey." It was thought that at that point the backbone might cease with safety. In the case of flues exposed to excessive heat from furnaces, &c., it is provided that every flue shall for its whole height below the roof covering be enclosed with brickwork or other fire-resisting material, not less than eight and a half inches in thickness all round, except in specified cases where there is no danger of communicating fire. The Committee think this most important. Many flues, even from large kitcheners, are dangerous with less, and I have personally found, three storeys above the basement kitchen, the heat so intense as to cause black marks on the wall such as are seen near hot-water pipes.

The enactment regarding hearths to open fireplaces is extended to coppers, boilers, and stoves, and the minimum thickness of hearth and fire-resisting support together is made six inches.

It is proposed to forbid the dangerous practice of placing putlogs into flues during building operations. It is never possible to make good the parging inside, and the filling in of the brick is often so carelessly done as to allow smoke to pass through the joints.

Regarding flue pipes for conveying heated products of combustion, it is suggested that internal metal flues shall be limited to the storey in which they originate; that they shall not be longer than twenty feet; and that a minimum thickness of metal shall be required for all but vertical pipes.

To avoid questions as to what are low- and what high-pressure pipes, it has been sought to fix the temperature above which provision should be made to prevent danger from heated pipes.

Considerable alterations have been made in the construction of habitable rooms. The minimum height, except in the roof, has been increased from seven to eight feet. Minimum areas of windows of dormers and lantern-lights, and of the portions that shall open, have been fixed.

Flats forming residences for caretakers in warehouses are required to be separated by fire-resisting construction from the rest of the building.

The draft next embraces all the building regulations of the Public Health Act for underground rooms let as separate dwellings; and it must be a matter for congratulation by the Institute that the Government, in framing that Act, adopted in the sections many improvements suggested by the Institute. But the Committee felt that underground rooms which were not separate dwellings under the Public Health Act required to be also constructed so as to ensure the essentials of sanitation—*i.e.* damp-proofing of walls, drainage of subsoil, gas-proofing of drains, and floor-ventilating, and provision for heating. This section will, we hope, make the basement rooms for domestic servants in London houses healthier than many now are.

In framing this section the Committee have not forgotten that features on which it is necessary to legislate for houses inhabited by the poor are not required, and are often not possible in large town houses. The domestic servant, too, can assert himself or herself in a way that a cellar dweller cannot.

Projections beyond the general line of building have received careful attention. The sections have been drawn anew, and the material point to which attention should be directed is that cornices of shops may, to a specified extent, overhang the public way, but no other part of a shop front may encroach on it. It will be in the recollection of the Meeting that the interpretation of the old section 26, sub-section 2, regarding the projection of shop fronts on the public footpath, has been the recent subject of legislation. At the first trial the decision was adverse to the claim to bring out a shop front beyond the ground of the building owner, but on appeal it had been decided that the owner may under the section so encroach.

The common sense which often is common equity appears to be in the compromise suggested by the Committee. It seems unjust that a building owner should take without purchase a piece of land for which he would require heavy compensation if the public authority required it of him. In a building in the city to which I was architect, the public authority had to pay for 130 superficial feet of land so taken by them 5,000*l.*, or 35*l.* per square foot. On the other hand, the projection of a shop cornice

is in the same category as any other string or cornice of a building, and deprives nobody of any property.

À propos of structural projections, the Committee have introduced a section which merely legalises what may be said to be the general practice now existing. I refer to allowing bay windows and similar projections over a building owner's own land. All of us know the necessary but cumbrous formalities, and the delay that arises from the present obligation to submit in great detail drawings of all such projections to the County Council, whose consent must be obtained before any such projections can be commenced. It is to the credit of the Council, be it said, that they very rarely, if ever, withhold consent unless an adjoining owner objects. In the case of new streets of small suburban houses the bay window is the almost invariable rule; it is often the only picturesque feature in such houses; and we can imagine what a nightmare of dreary monotony these streets would be without this one redeeming feature. What is therefore so widely practised and generally commended should be legalised. The adjoining owner should be protected in such legislation, and this the Committee have done, they trust, in suggesting that no such projection shall come within 2 feet of the centre of a party wall, nor shall it extend outside a line drawn at an angle of 30 degrees from the point in the front of the building where it touches the centre line of the division between the properties. This secures to the neighbour a wide angle for light and prospect. Lastly, the section protects the public by stipulating that no projections shall be within 20 feet of the centre of the street.

It is a pleasure to note that the County Council in their amendments have a section with the same object that the Committee have in view, viz. to concede greater freedom of design to architects, or rather building-owners. They have drawn a clause, allowing under restrictions "projecting oriel windows or turrets" not only over the building owner's land, but 12 inches over the public way. This latter the Committee cordially approve and support. I think we ought to express our appreciation of the spirit in which the County Council have conceived this and other amendments. It shows on their part a desire to add to the picturesqueness of our city which we all must sympathise with.

The County Council have apparently not only confined their attention to overhanging constructions, but have, unconsciously perhaps, been thinking of them only in relation to the public thoroughfare which they may overhang. This appears to account for the condition they make that the oriels and turrets shall not be lower than a certain height above the level of the footway. That is right and proper where they overhang the public way, but it is manifestly unnecessary and constructively undesirable where they are over the building owner's land. In this case, overhanging windows &c. should, of course, be permitted; but if that be so, *à fortiori*, projecting windows which arise from a solid foundation should also be allowed. The Council's conditions as to the maximum width and distance from the party wall appear unnecessarily restrictive, and do not seem to have any constructive necessity. May we suggest that the sections of the Draft meet all that is required in the limitation of such projections?

The next section of the proposed Act deals with the separation of buildings and limitations of their areas.

The first alteration of importance is, that the Committee have endeavoured to prevent the danger that arises from the flank external wall of a building being subsequently utilised as a party wall when the adjoining building is raised or a vacant site is covered to the same height as the existing building. In such a case, what becomes a party wall may have timber in it, and may otherwise contravene many parts of the Act. It is proposed that no external wall shall be used as a party wall unless it has been erected or is altered to conform to the regulations for party-walls ; and the onus of proving that it is so constructed shall be upon the owner of such wall if he is desirous of its being so used.

We then come to a sub-section designed to ensure the construction of party walls in buildings subsequently converted into two or more buildings. I will instance how the Act may be and is evaded. It is intended to erect, say, six warehouses for separate occupation. The building owner erects one building enclosed by four walls ; subsequently he subdivides this by five wooden partitions from bottom to top, leaving a door opening on each, or maybe only on *one floor*. This opening has a door or doors fixed in it ; these door openings technically leave the whole as one building, but the six divisions are separately let, and a tenant is perhaps not aware that the seemingly solid divisions are not walls, and that he is not protected by a fire-resisting division from his neighbours. The Committee think that he should have such assurance as an Act can give of such protection. Another new section has a similar drift. In principle the Act says the division between buildings shall be a party wall or two external walls, not one external wall; and by deduction it infers that if the lower of two buildings is raised to the height of its neighbour it shall still be so divided.

The Committee therefore say, " No opening shall be made in any external wall " immediately adjoining or within six inches of any building above the level " of the lower building ; and if it is made, the adjoining owner or the Council may require the building owner to block it up ; and if he does not, either of them may do it at his cost. In this there is no hardship to the building owner, and incidentally it prevents the not infrequent iniquity of the owner of the taller building opening a window above the neighbouring property, and acquiring a right of light which precludes the neighbour from raising his building.

In place of the old sub-section 2 of section 27, a new section is intended to secure fire-resisting construction in a building erected in or converted into " two or more " divisions intended for or adapted to be used as flats or domestic buildings of classes " A and B, or as warehouses, or is let or occupied in two or more such divisions." No such division, if *in more than one occupation*, shall exceed 3,600 feet in area, or 50,000 cubic feet, without being separated by walls or floors of fire-resisting material from its neighbours. It will be noted that this does not prevent any division *in one occupation* being larger, just as a private house may be any size, but in a warehouse no one division shall contain more than 216,000 cubic feet. In the framing of the sub-

section just considered there is an incidental change which is of great importance. The old sub-section says that "sets of chambers or rooms tenanted by different "persons shall" in certain buildings be deemed to be "separate buildings." Now it is manifestly a confusion of terms to say that a part of a building shall be a building or a separate building from that of which it forms a part, and it has led to frequent disputes and litigation. As a separate building no flat can comply with all the requirements of the Act for buildings. It has no site, foundation, footings, parapet, roof, or chimney-stacks.

The Committee assume a building to be that which it is popularly understood to be, viz. a cube resting on the ground and covered by a roof; and this is in accordance with what the Court of Appeal has recently decided to be the intention of the framers of the 1855 Act.

The next new matter is "egress from certain buildings." If a building containing flats is of greater area than 5,000 feet, or of greater height than 60 feet above the public way, &c., or where in any such building of that height the distance from the end of any corridor to a staircase exceeds 60 feet, or wherever any warehouse contains a flat or other habitable rooms, every staircase shall be of fire-resisting material, and be carried up to the roof, and on such roof a fire-resisting gangway, described in detail, shall afford a passage to another similar staircase having a communication "with the street or other open space." In drafting the actual section it will be well to state that the communication with the street may be through a hall or corridor of fire-resisting material. The necessity for the provision we think no one will question. There is a parallel, but not of course identical, provision in the building law of Russia, which we have been enabled to study owing to the courtesy of the Secretary of State for Foreign Affairs, who most kindly obtained for the Institute a translation of that law affecting egress from buildings.

Of course Section 29 of the General Powers Act has been incorporated. This gives power to the Council to permit buildings exceeding 216,000 cubic feet under special conditions. Except as so permitted, the present law requires warehouses and trade buildings to be divided by party walls so that no division shall exceed 216,000 feet. The Committee add to the buildings which must be so divided blocks of offices, but permit the division in both classes of buildings to be by party walls or floors (of course of fire-resisting material), and apply the rule to all such buildings which are at any time joined together or added to.

Next we introduce the important question of lift shafts. At present if these are outside the external wall of a building, they must, by the County Council's rendering of the Act, be enclosed by walls of the same thickness as required for the walls of buildings of the class and height to which they are attached. If they are inside they need as lift shafts have no enclosure at all, but they may be enclosed and run all through the fire-resisting floors of a building, thus forming a furnace shaft, facilitating the spread of a fire from the bottom to the top.

The Committee divide lifts into three classes:

1. Those which are inside a building with fire-resisting floors, containing flats or business offices. These lifts, it is suggested, must be separated from flats or offices by brick walls; and all openings into the shafts from within the entrance doors of flats (where, of course, people sleep) must have an iron door in addition to a wooden one.

2. Those which are outside the external wall. The enclosures to the shafts for these, or for cylinders, balance weights, or gearing, are to be either of brickwork or of ironwork, or other fire-resisting material, to the satisfaction of the district surveyor.

This latter is a very convenient provision. It sometimes happens that it is impossible to get the space for a brick enclosure. If the floors of the building are required by the Act to be of fire-resisting construction, then any openings into the shafts from within the entrance doors of flats, or from any warehouses or business offices, are required to have an iron door as above.

3. Those inside warehouses which pass through floors required as above to be fire-resisting. In warehouses where it is not the practice to enclose the lifts with walls, all openings in these floors must have a horizontal door, hatchway, or other cover of iron or other fire-resisting material as specified.

It is believed that the adoption and maintenance of these regulations would very materially reduce fire risks. Where life is in question the cost of these safeguards should not be considered; but to those who object to the cost where property only is at stake I would say, that in a building now being constructed under me I have, by the adoption of special fire-resisting construction, including the lift-shaft treatments here suggested, saved my clients 300*l.* a year on their insurance, at an outlay of under 500*l.* beyond what is required by the present Acts, and the cost of fire-resisting floors.

The Committee propose that the present maximum height of buildings in sub-section 1 of the section 36 of the 1890 Act should be reduced to 75 ft., and the height of the two storeys in the roof should be limited to 20 ft. At present there is nothing to prevent a building 90 ft. high to the parapet, and above that a private theatre or gallery in the roof another 90 ft. high.

Next in order are the important sanitary provisions for open spaces at the rear or side of dwelling-houses. This subject has received most careful consideration, and many are the points of view from which it has to be considered. In localities which were or are primarily residential, the probably universal practice has been to attach to the house a large open space for a garden. As, however, the locality changes its character other considerations come into play. That which was a congeries of residences becomes a very busy town. The wear and tear of business lead people to desire to get away from its associations and to live in another place; the business success of the town attracts other business people to it. The charm of and desire for the original garden disappear; the demand for sites for business premises increases —and so in time this demand is supplied from the waste garden. The process of packing goes on until it becomes a question where it shall be stopped. In Paris the

process has gone so far, that, as Mr. Slater informed you, houses facing parallel streets are allowed to back on to one another, a party wall only separating them. No more insanitary condition than this can be imagined for terrace houses. It is impossible to get a cross-current of air to sweep through the rooms and remove poisoned or stagnant air. Going to the other extreme, the County Council of London are now proposing to require an open space at the rear of not only domestic but of all buildings, which space between the tops of the opposite backs of two buildings (assuming the back to be of a height equal to the front) will be practically double the width required between the opposite fronts of buildings.

I would ask you to bear with me while I analyse the working of the proposed section:

Assume, then, three buildings which are parallelograms, *i.e.* with no back additions [see A, p. 180]. Two face each other; their front walls are 75 ft. high, and they are separated by a street 70 ft. wide; the third is behind, and backing on to the second; between the second and third blocks is also a road 70 ft. wide. By the operation of the section there must be above the ground floor of the building 90 ft. between the backs of the blocks, and the external walls forming the backs cannot be more than 45 ft. high, while the front walls, 70 ft. apart, may be 75 ft. high.

Again [see B, p. 180], take the same three blocks, but make the back road 50 ft. wide, and we get 70 ft. between the backs, the walls on each side being limited to a height of 35 ft., while with the same distance between the buildings in the front road the height in front may be 75 ft. Can there be any justification whatever for such a consequence? Again, I see in it room for a crop of litigation, and, what is worse, the ultimate abrogation of the section by evasion.

For instance, which is the back of a building? Given two good roads, why should a building have a back at all? Why cannot it have, like hundreds of existing buildings in such situations, a front to each road? If it has, the section at once vanishes, unless, indeed, the Courts impose an interpretation on the section that there must be of necessity a back to every building. Assume such a decision. What is there to prevent an owner putting the front of his building towards the back road of my example? Then we should get the enactment nullified so far as it has an intention to assure a uniform open space between the opposite houses in that back street. We should certainly get an irregular skyline, giving room for picturesque treatment; but that is not the intention of the clause, and the owner of the lower building would fail to see the equity of a law which permitted his neighbour to build twice as high as he was allowed to do.

But if the case be bad where there is a back street it is worse where there is none. Assume the depth of a site to be 55 * feet: the building may then be 45 feet deep [see C, p. 180]. The application of the Council's rule will permit the rear wall to be

* A great number of shop sites all over London—as, for example, in Bond Street—are less than 50 feet deep. It may also be noted that had the proposed regulation been in force when the Hôtel Métropole was built the height of its back in Whitehall Place could only have been two storeys.—E. T. H.

10 ft. high only, and not only so, but it will only allow the front wall to be 50 ft. high, and that with a skyline of dull and drear monotony in the main street 70 ft. wide.

The Council make an exception to their rule in the city of London, and I am not forgetting that individual exceptions to conserve old heights are also provided for under certain conditions. These, however, do not touch the principle. If compensation were proposed to be given, I cannot but feel that the proposal is so costly that it would not be entertained for a moment; but if the public in its corporate capacity would not entertain the cost, how can individuals be expected to bear the loss?

In the suburbs of London which are primarily residential the rule is more than complied with now in common practice; but where the great congestion is, the buildings are primarily non-residential. Even where they are residential there is no compulsion on people to reside in them unless it be in the case of workmen, for whose dwellings special legislation has been and may again be made because they are not always free agents.

These problems have all received consideration, and they have guided the Committee to reaffirm section 29 of the 1855 Act for buildings erected before 1882, and to re-model section 14 of the 1882 Act in the following particulars: (1) to insist on a minimum area at the rear or side of every building 10 feet in depth for every foot of frontage of the building; (2) the narrower face of a corner building shall be deemed to be its frontage; (3) if there is any underground living or habitable (that is, sleeping) room, it must have a window or skylight directly opening into the open air, and if this can only be obtained by opening into the reserved space at rear, then there shall be no storey erected over the said space higher than the level of the cill of such window or of the roof on which the skylight is fixed. In other cases the present ground-floor storey is permitted over the area, and the wording of the section is varied in other particulars.

A sound principle to bear in mind in considering this sanitary question of open spaces is, that restrictive building legislation is only justified where it can be shown to be necessary for the health of the community. I submit that in the case in point what is adequate to this end is to provide that a direct through current of wind, *i.e.* air in motion, may be enabled to blow past the back and front of every house. If this be secured there will be no place for air to stagnate. It is the deep well-hole, enclosed all round and with no through current, that is the evil. That evil the Committee have sought to obviate, and we trust the County Council will on further consideration agree that the necessities of the case are met by the Institute's suggestion.

Following the preamble, the Committee have inserted a new section dealing with "drain and other pipes and sanitary apparatus." It leaves all details to by-laws. It lays down as essentials that drains shall be gas-tight, that there shall be ready access to them, and that they shall be efficiently ventilated; that rain-pipes, and wastes from lavatories, baths, sinks, safes, and cisterns, shall be disconnected from all drains.

Dealing with the construction of public buildings, the following is an epitome of matters which the Committee have suggested should be subject to the approval of

the superintending architect, under by-laws to be made by the Council: Lobbies, corridors, passages, and stairs—their construction with and support by fire-resisting material; railings and balustrades; access and egress; ventilation, water supply, extinction of fire; all doors are to open outwards.

As to structural defects in theatres, &c., it is proposed to alter the wording of section 11 of the 1878 Act so that the Council may be able to deal with "existing "insufficient or dangerous accesses or staircases and sanitary defects from which "danger may result to the public." Other alterations flow from the extended scope of the Bill, which is to deal with sanitary danger as well as danger from fire. I see that the County Council are about to consider new by-laws which deal with all these points.

Akin to a section already referred to, viz. the "alteration in the purpose or character "of a building," is the conversion of houses, &c., into public buildings. The old section has been widened in its scope, so that if it is proposed to use as a public building any building erected for another purpose, it shall, if required by the district surveyor, be altered or strengthened.

I have now come to the end of the sections which the Committee have put into printed form, but there are other matters which they have settled, and the Council of the Institute have approved in principle, but which have not yet been formulated. Among these I may note the suggestions:—

1. That power should be given generally to the County Council to dispense with any of the provisions of the Act or by-laws unless the contrary is specifically enacted. In the most carefully drawn Act of Parliament there may be individual cases where the law should be relaxable for sufficient cause shown, and the relaxation should rest with that body to which the Legislature entrusts the local administration of the Act.

2. That if an application be made to the Council in compliance with the Act for, or in connection with, a building or structure to which the general rules of the Act do not apply, and if it be disapproved, the ground of disapproval shall be stated.

The object of this is, of course, to enable an applicant to meet the objection. In the past it has only been by the courtesy of an official that any information could be obtained, and great practical inconvenience has frequently arisen in consequence. Another point is, that a limit of time should be fixed within which the Council should give a decision on an application. Cases of great hardship have occasionally arisen under this head.

With reference to the widely extended power of making by-laws, it is suggested that the present process of the 1878 Act should be adopted in the new Act. I feel sure this is in the public interest, as it brings to bear on any proposed enactment the experience and technical knowledge of the Institute of Architects and of the Surveyors' Institution, as well as the views of bodies of persons who may be specially affected by the proposed new rules.

The sections 83, 84, and 85 of the 1855 Act, dealing with the rights of building

and adjoining owners and the expenses incident to party walls and structures, will require modification, and among other points that are before the Committee may be mentioned:—

1. It is proposed to shorten the time for a party wall notice from three to two months. 2. To alter the mode of service of a notice. At present, as you all know, every tenant of a single room in a building who holds on a longer tenure than from year to year is entitled to a notice. It is very difficult to find out all such tenants in, say, a block of offices, and the delay that may arise from the omission to serve one may cost a large sum of money. A not unreasonable suggestion is under consideration, that a party-wall notice shall be deemed to be given to all adjoining owners by affixing it on the door or in some other conspicuous position on the adjoining premises.

I have already referred to the proposed method of making an adjoining owner pay for such part of a party wall as he may from time to time use, and a new sub-section will be required to deal with the cost of parapets required under our new section, framed on the Bristol case, when the 10 ft. difference in heights of adjoining buildings is diminished. The County Council in their paper adopt the principle of this in regard to fence walls, but it is equally equitable for all party walls.

Power should also be specifically given to underpin walls; to omit footings on one side of an external wall where it abuts against another external wall; to allow the footings of an external wall, and the concrete for their support, to be placed on vacant land adjoining the wall. Another defect to be remedied is that in the machinery for settling disputes by the award of the surveyor or surveyors there is now nothing to compel either building or adjoining owner to take up the award, or to pay the costs of it if it be not taken up. At present such costs appear to be irrecoverable at law.

There is one question which I feel is a delicate one, but at the same time no paper dealing with a new Building Act can be complete without referring to it. It is that of the duties and remuneration of district surveyors. It will be manifest to all who have studied the suggestions for the new Bill, or who have followed me to-night, that the new duties imposed on district surveyors are many and various.

It follows in equity that there must be fees payable in respect of these new duties; and not only so, but the services demanded of district surveyors in respect of modern buildings are, owing to the vast size of many of these, so great that their remuneration, fixed in the year 1855, before such huge buildings were contemplated, is often very inadequate. It is certainly insufficient to give a maximum fee of 10 guineas for such a building as the Hôtel Métropole or the National Liberal Club. On the other hand, it is, I think—and here I must carefully say I am not giving the opinion of the Committee, for they have not yet expressed one—but in my opinion it is as manifestly excessive to pay fees as for a separate building on every tenement in a block of workmen's dwellings or superior flats. Were the Hôtel Métropole a block of flats, the fees so calculated would probably come to 300*l.* to 400*l.*; yet in a large hotel the problems of construction are intricate, dealing as they do with immense

rooms with wide spans in which great assemblies may be held, whereas in flats with small rooms there are relatively no such problems.

In another part of this Paper it has been pointed out that the several tenements in a building are not buildings in any reasonable sense, and I contend that in the matter of fees there is no justification for their being so treated. By all means increase the maximum fee, but still fix one. The district surveyor's new duties are many and various, and the same remark applies to those of the superintending architect. The discretionary power of all these officials is proposed to be largely extended; their authority over buildings is to be greatly increased; and, as a consequence, the possibility of their sometimes coming to erroneous decisions must not be overlooked. It will be, therefore, probably wise to give an appeal from all or most of their decisions —under conditions, of course; and as these decisions will be practically all on technical points—those of policy being reserved to the Council—the Tribunal of Appeal constituted by the 1890 Act, which, of course, will be incorporated in the new Act, appears to be the proper one to which such appeals should go, while from the decisions of the Council the appeal should be, as it now is, to a nominee of the Secretary of State. The machinery for these appeals requires careful consideration.

These tribunals must not be confused with the magisterial or other courts, the duties of which are to enforce the law. These must still have jurisdiction, for the simple reason that they, and they alone, have at their back that force which is the ultimate sanction of all law.

In bringing my Paper to an end I wish to say that, as an exponent of the Practice Committee's views, I have naturally been silent on those of the Council of the Institute, which, however, are expressed in their endorsement of the suggestions emanating from the Committee. Nor have I dealt with the amendments proposed by the County Council, except with a few of the most important ones which treat of matters that have been fully considered by the Committee. I have endeavoured to set before the Meeting the arguments for and against the different conclusions arrived at. I trust that any lack of perspicuity on my part will be pardoned, as well as the heavy tax I have levied on your patience. The County Council's other amendments are of great importance, and are in process of digestion by the Committee. With some, I think, the Committee will cordially agree. From others I fear they will dissent. In many we see dangers in principle and wording which we believe have only to be pointed out to the Council to ensure their acquiescence in our views. In conclusion, I am sure, Sir, I may, in your name, assure both the Local Government Board and the County Council that the Institute is at all times ready to assist in perfecting building legislation for the improvement of the Empire's great metropolis, of which we are all proud. It is our Charter's boast that we, as a corporate body, exist for the advancement of architecture, and architecture is at its highest when its creations not only display the grace of artistic clothing, but are the shrine of healthy and vigorous life. We venture to hope that the labour which has been bestowed on the suggestions for the Draft Bill is an earnest that such an assurance is not an empty

form of words, but a reality, and we trust that that labour may speedily have its fruition in an Act on the lines suggested, and that flowing from this an era of better building, greater security, improved health, and consequently greater happiness, may dawn for our co-citizens.

EDWIN T. HALL.

SUGGESTIONS FOR A DRAFT BILL FOR THE CODIFICATION AND AMENDMENT OF THE METROPOLITAN BUILDING ACTS (FIRST PORTION TO END OF SECTIONS DESCRIBING CONSTRUCTION).

Prepared in 1890–91 *by the Practice Standing Committee, and considered and adopted by the Council of the Royal Institute of British Architects, Monday,* 30*th November* 1891.

1. Details of construction, which are subject to variation from time to time by reason of, *inter alia*, new inventions, new materials or modes of construction, &c., should be omitted from the body of the new Act, and be placed in schedules attached thereto, power being given by the Act to the County Council and to the Commissioners of Sewers, as the case may be (subject to provisions corresponding to those of Part II. of the Metropolitan Management and Building Acts Amendment Act, 1878), to vary these as occasion shall require, the object being to allow of changes in details of construction without the necessity of going to Parliament.

2. The new Act should be confined to and extend to everything within and enclosing the curtilage of a building, including any vaults under a public way; it is also suggested that it should include sanitation (*i.e.* drainage, air-spaces, ventilation, plumbing, &c.), and regulations respecting lines of frontage of buildings.

3. The construction of roads, sewers, and bridges, and of everything in the nature of public thoroughfares for use in common by the public, should be excluded.

4. Rights of light and air should be excluded, as they are in the nature of private property.

5. Restrictions on design, which are questions of taste, should be excluded.

6. Erections which are not buildings should be subject to control or supervision of district surveyors. Under this head would come: glass covers to yards, private bridges between buildings in one occupation, telephone and telegraph posts on buildings, wall-signs, fowl-houses and similar domestic structures, metal pipes for flues, &c.

***** Those clauses or portions of clauses which are hereinafter printed in italics have been retained from the several sections of existing Acts of Parliament.**

AN Act to consolidate and amend the Laws relating to the Construction and Use of Buildings in the County of London.

WHEREAS it is expedient to consolidate, amend, and add to the laws relating to buildings in the County of London with the view to further secure that all buildings shall be of sound construction and arranged with due regard to the health and well-being of the persons using them and to their safety from fire or pestilence: Be it therefore enacted by the Queen's Most

Excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons in this present Parliament assembled, and by the authority of the same, as follows (that is to say) :

Preliminary.

Short title.

I. This Act may be cited for all purposes as "The Metropolitan Build-"ing Act, 189–."

II. This Act shall, except in cases where it is otherwise expressly provided, come into operation on the first day of January, one thousand eight hundred and ninety ——.

Interpretation of certain terms in this Act.

III. In the construction of this Act (if not inconsistent with the context) the following terms shall have the respective meanings hereinafter assigned to them (that is to say) :

"The Treasury" shall mean the Commissioners of Her Majesty's Treasury.

"Building" shall include every erection comprising a cubical space defined by walls, piers, posts, or other structures, and a roof or other covering, whether such erection is wholly enclosed or not, and whether it is intended to be permanently fixed or not, and of whatever materials it is constructed, and for whatever purpose it is used or constructed or adapted (but so that this interpretation be not construed so as to exclude from the application of the term "building" as used in this Act any erection that would have been determined to be a building according to the true construction of this Act if this interpretation had not been inserted in this Act).

"Structure" shall include any wall or other erection and anything affixed to or projecting from any building, wall, or other erection.

"*Public building*" *shall mean* a building any part of which is used or constructed or adapted to be used either ordinarily or occasionally *as a church, chapel, or other place of public worship, or* as an infirmary, *hospital,* workhouse, *college,* school (not being merely a dwelling-house so used), *theatre, public hall, public concert room, public ballroom, public lecture room, public exhibition room,* public bathhouse (whether owned by a public authority or private corporation or proprietor), public gymnasium, or as a public place of assembly for persons admitted thereto by tickets or otherwise, or used, or constructed, or adapted to be used either ordinarily or occasionally for any other public purpose.

"Sky-sign" shall mean any word, letter, model, sign, device, or representation in the nature of an advertisement, announcement, or direction supported on or attached to any post, pole, standard, framework, or other support, wholly or in part over any house, building, or structure which or any part of which sky-sign shall be visible against the sky from any point in any street or public way, and

includes all and every part of any such post, pole, standard, framework, or other support. The expression "sky-sign" shall also include any balloon, parachute, or similar device employed wholly or in part for the purposes of any advertisement or announcement on or over any building, structure, street, or public way, but shall not be deemed to include (1) *any flagstaff or pole,* (2) *any vane or weather-cock, unless adapted or used wholly or in part for the purposes of any advertisement or announcement, or* (3) *any sign which is securely fixed to or against but not over any building, or which rests immediately upon the top of any wall or building being of one continuous face, and not open work, or* (4) *any such word, letter, model, sign, device, or representation as aforesaid which relates exclusively to the business of a railway company and which is placed or may be placed wholly upon or over any railway, station, yard, platform, or station approach belonging to a railway company, and which is also so placed that it could not fall into any street or public place.*

"Wall-sign" shall mean any word, letter, model, sign, device, or representation in the nature of an advertisement, announcement, or direction fixed to or against any wall, shop front, or other vertical enclosure to any part of a building or structure, and includes all and every part of any framework, bracket, or other support by which it is attached or suspended.

"Warehouse" shall mean a building any part of which is used or constructed or adapted to be used as a stall for wares or goods in bulk, a mill, factory, manufactory, printing works, brewery, or distillery.

"Domestic building" shall mean (Class A) a building used, constructed, or adapted to be used wholly or principally for human habitation; (Class B) an outbuilding or stables appurtenant to a building of Class A or C whether attached thereto or not; and (Class C) a building used or constructed or adapted to be used wholly or principally for business offices or shops or any other building not being a public building or a warehouse or domestic building of Classes A and B.

"Habitable room" shall mean a room in which a person passes the night, and evidence giving rise to the presumption that some person passes the night in a room shall, until the contrary is proved, be evidence that such room is a habitable room.

"Living room" shall mean any room in a domestic building of Classes A and B, or in any flat, which room is intended or used for human occupation by day, and shall include kitchen, scullery, pantry (not larder), and similar domestic offices.

"Underground room" shall mean any habitable or living room in a domestic building the surface of the floor of which room is more than three feet below the surface of the footway or of the adjoining street or of the ground adjoining or nearest to the room.

"Flat" shall mean one of a series of separate residences or dwellings

contained in a building with an entrance door to such residence or dwelling opening off any hall, corridor, staircase, or landing in such building.

"Business offices" shall mean any counting house, professional or mercantile chambers, or offices used for the purposes of carrying on any profession, business, or calling, with an entrance door to such business offices opening off any hall, corridor, staircase, or landing in such building.

"External wall" shall apply to every outer wall or vertical enclosure of any building not being a party wall.

"Party wall" shall apply to every wall used or built in order to be used as a separation of any building from any other building, with a view to the same being occupied by different persons.

"Cross wall" shall apply to every wall used or built in order to be used as a separation of one part of any building from another part of the same building, such building being wholly in one occupation.

"Party structure" shall include party walls, and also partitions, arches, floors, and other structures separating buildings, storeys, or rooms which belong to different owners, or which are approached by distinct staircases or separate entrances from without.

"Storey" shall mean the space above the upper surface of a floor and up to the upper surface of the floor next above it, or up to the under surface of the tie of the roof, or up to half the vertical height of the underside of the rafters if the roof has no tie, or if the roof be flat then up to the under surface of the bearers which immediately carry such flat; but any separate space there may be of a less height than five feet either above the tie of a roof or under the basement or lowest floor shall not be deemed to be a storey.

"Topmost storey" shall mean the uppermost storey in a building, whether constructed wholly or partly in the roof or not, and whether constructed or adapted or used for habitation or not.

"Site" in relation to a house, building, or other erection, shall mean the actual ground covered by such house, building, or other erection, and any ground appertaining thereto, or belonging to the building owner thereof, within a line drawn outside and at a uniform distance of three feet from the outer edge of the footings of the external or other enclosing wall thereof.

"Area" of every building shall be deemed to be the superficies of a horizontal section of such building made at the point of its greatest surface, including the external walls and such portion of the party walls as belongs to the building, but excluding any attached building the height of which does not exceed the height of the ground storey.

"Floor area" shall mean the superficial measurement of the horizontal surface enclosed by the inner face of the external walls or by the external and party walls of any building or other erection, or any division of either.

"Superficies" shall mean the superficial measurement of the vertical

face or elevation of any wall, pier, recess, or window, or of any other surface in a vertical plane.

"Cubic contents" of any building shall mean the space contained within the inside face of the external walls or of the external and party walls or of other vertical enclosure and of the lowest floor and the underside of the rafters or joists immediately supporting the uppermost covering of the building.

"The base of the wall" shall mean the top of the footing or the top of any bressummer carrying a wall.

"Foundation" shall mean that on which the walls, piers, and other supports of any building or other structure rest.

"Fire resisting" in relation to material shall mean (*a*) For construction—(1) concrete of broken brick, of gravel, of broken stone, of coke breeze, of ashes, or slag, or any of them, mixed together with cement; (2) well-burnt brick, terra cotta, natural or artificial stone; (3) iron, steel, or bronze, and other material of similar character to any of the foregoing which the district surveyor may approve, as well as for bressummers and posts, wood beams of not less width and depth in any part than ten inches. (*b*) For covering roofs or walls externally—concrete as aforesaid, tiles, terra cotta, slates, stone as aforesaid, copper, lead, zinc, asphalte, cement (whether dressed with tar and sand or not), glass, and iron, or steel, and other material of similar character approved as aforesaid. (*c*) For coating timber or other combustible material—cyanite, plaster, cement, or other material * approved as aforesaid.

"*Owner*," save and except as defined in Section XXXV of this Act, *shall apply to every person in possession or receipt either of the whole or of any part of the rents or profits of any land or tenement, or in the occupation of such land or tenement other than as a tenant from year to year or for any less term, or as a tenant at will.*

"*Builder*" *shall apply to and include the master builder or other person employed to execute*, or, where there is no such employment, the building owner or foreman of works or other responsible person *who actually executes* or controls *any work upon any building.*

"*District surveyor*" *shall mean every such surveyor who is appointed in pursuance of this Act, or whose appointment is hereby confirmed, and shall include any deputy or assistant surveyor appointed under this Act.*

"Surveyor" in Sections XXVII to XXXII of this Act shall mean the district surveyor so acting within his district.

* The reference in various clauses of this Draft Bill to "other material" in connection with the term "fire-resisting," would necessitate the insertion in the body of the Act of the following provision:—In the event of the Council, the building owner, or builder dissenting from any decision of the district surveyor in relation to such "other material," the matter or thing in dispute shall be referred to the tribunal of appeal provided in Section LXVI of this Act.

In all cases in which the name of an officer having local jurisdiction in respect of his office is referred to without mention of the locality to which the jurisdiction extends, such reference is to be understood to indicate the officer having jurisdiction in that place within which is situate the building or other subject-matter or any part thereof to which such reference applies.

"Person" shall include "a body corporate."

"The late Board" shall mean the Metropolitan Board of Works established by the 18 & 19 Vict. c. 120.

"Council" shall mean the London County Council.

"Commissioners of Sewers" shall mean the Commissioners of Sewers of the City of London.

"Street" shall include that portion of the surface of the ground which is set apart for municipal purposes and regulated by law for the public accommodation of carriage or foot traffic, or both of them, whether wholly or partially, and also includes road, highway (except the carriage way of a turnpike road), public bridge (not being a county bridge), lane, footway, square, mews, court, alley, passage, or way (whether a thoroughfare or not), and any part thereof.*

The term "centre of the street" in relation to any street formed prior to the 18th August 1890, shall mean the centre of such street as existing immediately before the time when first after the said 22nd day of July 1878, and prior to 18th August 1890, or the formation of the same any house or building fronting towards or abutting upon such street was begun to be constructed or extended, and in relation to any such street formed or laid out after the 18th August 1890, the Council may at any time define the line constituting the centre of the roadway, and the line so defined shall continue to be deemed to be the centre for those purposes, notwithstanding that the actual centre of the roadway may have become altered by reason of the roadway or street having been widened, either on one side only or on both sides, to an unequal extent.†

The term "the prescribed distance" shall mean twenty feet from the centre of the street *where such* street *is used for the purpose of carriage traffic, and ten feet from the centre of the* street *where such* street *is used for the purposes of foot traffic only.*

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* The following provision should be inserted in its proper place as a section of the proposed Act:—The Council may from time to time declare by resolution or order whether or not any place is a street for the purposes of this Act, and where any street begins or ends, and every such declaration shall be conclusive.

† The Section (xxx) in the London Council (General Powers) Act 1890, defining line constituting "centre "of roadway," should be incorporated in the proposed Act as follows:—For the purpose of any enactment in this Act or the Metropolis Management Acts referring to the centre of roadway in the case of a street formed or laid out after the passing of this Act, the Council may at any time define the line constituting the centre of the roadway, and the line so defined shall continue to be deemed the centre for those purposes, notwithstanding that the actual centre of the roadway may have become altered by reason of the roadway having been widened, either on one side only or on both sides, to an unequal extent.

LIMITS OF ACT.

IV. *This Act* shall extend to all places within the limits of the Metropolis as defined by* the Schedule hereto annexed; *but nothing herein contained shall affect the exercise of any powers vested by any Act of Parliament in the Commissioners of Sewers of the City of London for the time being.*

REGULATION AND SUPERVISION OF BUILDINGS.

Buildings, &c., herein named exempt from operation of part of this Act.

V. The following buildings and works shall be exempt from the operation of Sections † No. to inclusive:

Bridges, piers, jetties, embankment walls, retaining walls, and wharf or quay walls.

Her Majesty's royal palaces, and any building in the possession of Her Majesty, her heirs and successors, or employed for Her Majesty's use or service.

Common gaols, prisons, houses of correction, and places of confinement under the inspection of the Inspectors of Prisons, and Bethlehem Hospital, and the house of occupations adjoining.

The Mansion House, Guildhall, and Royal Exchange of the City of London.

The offices and buildings of the Governor and Company of the Bank of England already erected, and which now form the edifice called "The Bank of "England," and any offices and buildings hereafter to be erected for the use of the said Governor and Company, either on the site of or in addition to and in connection with the said edifice, but shall not include any branch of such Bank erected in any other part of the Metropolis.

The buildings of the British Museum.

Greenwich Hospital and buildings in the Parish of Greenwich vested in the Commissioners of Greenwich Hospital, and used for the purposes of the said hospital.

All county lunatic asylums, sessions houses, and other public buildings belonging to or occupied by the Justices of the Peace of the county or city in which the same are situated.

The erections and buildings authorised by an Act passed in the ninth year of the reign of His late Majesty King George the Fourth, for the purposes of a market in Covent Garden.

The Cattle Market, with its appurtenances, erected in pursuance of the Metropolitan Cattle Market Act, 1851.

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* It is suggested that the proposed new Act be not divided into parts, as such division serves no useful purpose.

† These sections will be those which, under the old division, would be Part I. of the Act.

Any building belonging to a canal, dock, or railway company, being in the actual occupation of the company and used exclusively under the provisions of any Act of Parliament for purposes of the company's canal, dock, or railway, and being in every part thereof distant at least fifty feet from any street and from any building or ground not belonging to the company.

[The provisions of Sections VI, VII, VIII, and XIII of the Act 45 Vict. c. 14 (1882), shall not apply to the City of London and the liberties thereof.]

All buildings not exceeding in height thirty feet in any part, *as measured from the footings of the walls, and not exceeding in* cubic contents *one hundred and twenty-five thousand cubic feet, and not being public buildings, wholly in one occupation, and distant at least eight feet from the nearest street or alley, whether public or private, and at the least thirty feet from the nearest buildings, and from the ground of any adjoining owner.* But no building shall be exempt where it is erected on any estate laid out for building on which it is intended to erect other buildings or to let or sell any ground to any person other than to the owner of such building within the said distance of thirty feet from such building. If any building be erected under this exemption otherwise than in accordance with the provisions of this Act, no other building shall, unless with consent of the Council, be subsequently erected within thirty feet from such first-named building, unless both buildings be altered to comply with the provisions of this Act, or unless both buildings being attached shall, taken together, be exempt under the first part of this section.

All buildings not exceeding in area fifty feet, measured to the outside of the enclosing walls or partitions, and not exceeding in height seven feet six inches measured from the level of the ground to the under-side of the eaves or roof-plate, and distant at least ten feet from any other building and from any street, and not having therein any stove, flue, fire-place, hot-air or hot-water pipe, or other apparatus for producing heat, whether for warming or ventilating the same.

All buildings not exceeding in extent two hundred and sixteen thousand cubic feet, and not being public buildings, and distant at least thirty feet from the nearest street or alley, whether public or private, and at the least sixty feet from the nearest buildings and from the ground of an adjoining owner.

All greenhouses, so far as regards the necessary woodwork of the sashes, doors, and their frames; but if any greenhouse be attached to any other building, the exemption shall only apply to those greenhouses which do not exceed in area three hundred feet measured to the outside of the enclosing framing, and do not exceed in height at any point twenty feet measured from the floor of the greenhouse.

All fences not built of brick, stone, concrete, or any similar substance.

Openings made into walls or flues for the purpose of inserting therein ventilating valves of a superficial extent not greater than forty square inches, if such valves are not nearer than twelve inches to any timber or other combustible material, and if thereby no opening is made from one building to another through any party or other walls separating buildings.

Window openings existing previous to the passing of this Act in any wall which is used for the separation of the said buildings, so long as they remain windows external to any adjoining building.

Wall-signs exclusively over private property not used as a thoroughfare, if not exceeding sixteen superficial feet in size, measured over the surface, and over the voids enclosed by the outer line of the sign and its supports.

Buildings exempt from general provisions of this Act regarding construction, but subject to limitations and restrictions.

VI. The following erections shall be exempt from the general provisions as to construction contained in this Act, subject to the following limitations and restrictions, that is to say:

(1) Any private bridge constructed of fire-resisting material throughout, whether open or enclosed at sides or top, or both, and of not greater width than ten feet or height than fifteen feet, to connect any buildings or parts of buildings.

The construction of any such bridge shall not affect the construction of the buildings which it connects, and the openings from such buildings to the bridge (provided such buildings on the floor on which the connection is made are distant at least ten feet one from the other) shall be deemed to be only openings in the external walls of such buildings.

This section shall not be deemed to give authority for the erection of any bridge across a street, canal, or other public way.

(2) Open yards enclosed on one or more sides by buildings may be roofed over, provided that such roof be of fire-resisting material and glazed. No yard so roofed over shall be deemed to be a building within the meaning of this Act. Provided always that no such roof shall be, except with the consent of the Council, constructed which shall interfere with the direct access of light and air to any portion of a window constructed as the only means of giving light and ventilation to a habitable room.

(3) Buildings open on one or more sides may be erected if the roofs be covered with fire-resisting material, but no such open building shall be erected, except with the consent of the County Council, of greater area than two hundred superficial feet or of greater height at any point than sixteen feet or nearer than ten feet to any other building or erection on the same property, or to the land of any adjoining owner; but such open building of not greater dimensions than aforesaid may be erected nearer than ten feet to

such other building, or to the land of any adjoining owner, provided it has on the side or end next such other building or land a wall constructed in all respects in conformity with the regulations for a party wall, and such wall shall extend at least fifteen inches at each end beyond the limits of the open building.

External metal flue pipes.

VII. External metal flue pipes exceeding ten feet in length to be inspected by district surveyor every five years, and if, in his opinion, they are safe, a licence shall be granted by the Council for a period of five years from the date of such inspection. If unsafe, they shall be rendered safe to his satisfaction or shall be forthwith removed.

Temporary or movable wooden structures or erections not to be erected without licence of Council.

VIII. *It shall not be lawful for any person to erect or set up in any place any wooden structure or erection, unless the same be exempt from the operation of the first part of* this Act, *without a licence in writing first had and obtained from the* Council *for the erection or setting up of such structure or erection in such place, and every such licence may contain such conditions with respect to such structure or erection and the time for which it is to be permitted to continue in such place as the* Council *may think expedient; and if any person erects or sets up any such structure or erection in any place without having had and obtained such licence to erect or set up the same in such place, or makes default in observing any of the conditions contained in such licence, or is guilty of any breach of such conditions, he shall be liable to a penalty not exceeding five pounds, and to a further penalty not exceeding forty shillings for every day on which any such structure or erection continues erected or set up without such licence being had and obtained, or upon which such default or breach continues after the day on which the first penalty is incurred.*

Provided always, that a licence shall not be required in the case of any wooden structure or erection of a movable or temporary character erected by a builder for use during the construction, alteration, or repair of any building, unless the same is not taken down or removed immediately after such construction, alteration, or repair is finished; and if such structure or erection is not so removed as aforesaid, the Council shall have power to proceed by notice and to take such other steps with all the consequences following as are hereinafter prescribed [*see* Section LVI., Act 1855, and Section XII., Act 1882] in respect of the non-removal of an iron or other temporary building.

Application of Act.

IX. With the exemptions, limitations, and restrictions hereinbefore mentioned, this Act shall apply to all new buildings.

Building, when deemed to be new.

X. *A building shall be deemed to be new whenever the* external *walls thereof have not been carried higher than the footing previously to the first day of January,* one thousand eight hundred and ninety- ; *any other building shall be deemed to be an old building.*

Alteration in purpose or character of building.

XI. Any building, erection, or structure in any respect exempt from the operation of this Act, or in any way privileged in respect of any provision of this Act, shall remain so exempt or privileged as long only as it is used for the purpose or retains the character or is converted to a use, purpose, or character by reason whereof it is or would be so exempt or privileged, and forthwith on its ceasing to be so exempt or privileged or on its being converted to a use, purpose, or character other than one exempt or privileged as aforesaid, it shall become, subject to the provisions of this Act, applicable to its new use, purpose, or character, and shall be altered to conform in all respects to the requirements of this Act; or should its use, purpose, or character by reason of which it was privileged but not exempt be changed to such other use, purpose, or character as will entitle it to other and different privileges, then its original privileges shall cease, and in respect thereof it shall be altered to conform to the requirements of this Act.

Restoration of buildings of architectural, archæological, or historical interest.

XII. In the event of its being necessary or desirable to take down any portion of an old building of architectural, archæological, or historical interest constructed otherwise than in accordance with the regulations of this Act, or in the event of the destruction of any part of such building, the portion so taken down or destroyed may, with the written consent of the Council first obtained, or on the happening of either event to any building constructed with the written consent of either the late Board or the Council otherwise than in accordance with such regulations, then without such consent such building may be restored, replaced, or reinstated in the same material and in the same design as it formerly was before the happening of either of the said events, and Sections XIII, XIV, and XV hereof shall be construed subject to this section.

Alterations of and additions to old buildings.

XIII. With the foregoing exceptions, *any alteration, addition, or* structural reinstatement *made or done for any purpose except that of necessary repair not affecting the construction of any external or party wall,* or to which the rules and regulations of this Act are inapplicable, *in, to, or upon any old building, or in, to, or upon any new building after the roof has been covered in, shall, to the extent of such alteration, addition, or work, be subject to the regulations of this Act; and whenever mention is hereinafter made of any alteration, addition, or work in, to, or upon any building, it shall, unless the contrary appears from the context, be deemed to imply an alteration, addition, or work to which this Act applies.*

Rebuilding old buildings.

XIV. With the exceptions regarding the restoration of old buildings aforesaid, whenever the roof of any one-storeyed old building has been taken down or destroyed, the whole of such building, including the said roof, shall be made to conform to the regulations of this Act. In all other cases, *whenever any old building has been taken down,* or has been destroyed to an extent exceeding one-half of the cubical contents of such building, the portion

to be rebuilt shall be so rebuilt in conformity with the regulations of this Act; *and every other portion of such old building that is not in conformity with the regulations of this Act shall be forthwith* made to conform thereto.

Division of old buildings separated by irregular partitions.

XV. *Whenever any old buildings are separated by timber or other partitions* or divisions *not in conformity with this Act, then, if such partitions* or divisions *are removed to the extent of one-half thereof, such buildings shall be forthwith divided from each other in the manner directed by this Act.*

Notice of intention to build or take down house, &c.

XVI. *Every person who shall intend to build or take down any house, building, or wall (not being within the City of London), within ten feet of any public thoroughfare, shall give notice of such intention to the vestry or district board of the parish or district in which such house, building, or wall is situate, and shall, before commencing to build or take down any such house, building, or wall, cause to be put up such hoard or fence with a convenient platform and handrail (if there be room enough) for the same to serve as a footway for passengers outside of such hoard or fence as the vestry or district board may think to be proper and sufficient, and shall continue such hoard or fence and such platform and handrail standing and in good condition to the satisfaction of the vestry or district board during the building or taking down of any such house, building, or wall, unless the vestry or district board shall give their consent in writing to its previous removal, and shall when required so to do by the vestry or district board cause such hoard or fence and such platform and handrail to be well lighted from sunset to sunrise.*

Every person who fails to give such notice to the vestry or district board, or who commences to build or take down any such house, building, or wall, without causing to be put up such hoard or fence with or without such convenient platform and handrail, or who does not continue such hoard or fence with or without such convenient platform and handrail in good condition, to the satisfaction of the vestry or district board as aforesaid, or who does not when required so to do cause such hoard or fence with or without such platform and handrail to be well lighted from sunset to sunrise, shall, for every such offence, be liable to a penalty not exceeding five pounds, and a further penalty not exceeding forty shillings for every day on which such offence shall continue after conviction thereof, such penalties to be recovered by summary proceeding.

Foundations and sites of buildings.

XVII. *No building or other erection shall be erected upon any site or portion of any site which shall have been filled up or covered with any material impregnated or mixed with any fæcal, animal, or vegetable matter, or which shall have been filled up or covered with dust, or slop, or other refuse, or in or upon which any such matter or refuse shall have been deposited, unless and until such matter or refuse shall have been properly removed, by excavation or otherwise, from such site. Any holes caused by such excavation must, if not used for a basement or cellar,* or open area or yard, be filled in

in such manner and with such material as the Council shall by by-law made from time to time determine.

The floor area over the earth under every building shall be covered with a layer of cement concrete, or such other material, and of such thickness and laid in such manner, as the Council shall by by-law made from time to time determine.

Every building, if and where enclosed, shall be so enclosed with walls constructed of brick, stone, or other hard and incombustible substances, and the said walls shall rest on the solid ground, or upon concrete or upon a bressummer of fire-resisting material, or upon other solid substructure.

The foundations of the walls of every house or building shall be formed of a bed of good concrete, or other material approved by the Council, of the thickness shown in the Schedule No. attached to this Act, arranged according to the heights of the walls of (*a*) domestic buildings and (*b*) warehouses, *and projecting at least four inches on each side of the lowest course of the footings of such walls. If the site be upon a natural bed of* solid *gravel* or chalk of not less than three feet in thickness, *concrete* may be omitted from the foundations of the walls with the approval of the district surveyor.

Provisions as to buildings, &c., not erected on foundations or sites conformable with by-laws, &c.

XVIII. *In case any house, building, or other erection begun to be constructed after the passing of this Act is constructed or begun to be constructed upon any foundations or site or with any substances which have not been made, filled up, and prepared, or which are not in description and quality in accordance with the provisions of the by-laws relating thereto made under the authority of this Act, or in accordance with the terms and conditions subject to which the* Council *may have dispensed with the observance of any such provisions, the district surveyor may forthwith, by notice to be served on the occupier of such house, building, or other erection, or on the builder, owner, or other person engaged in constructing any such house, building, or other erection as aforesaid, require him to alter, pull down, or remove such house, building, or other erection, or any part thereof, as he may think proper; and in case any such occupier, builder, owner, or other person, during* seven *days after the service of such notice, fails to comply with the requirements of such notice, he shall be liable to a penalty of not less than ten shillings, and not more than forty shillings, for every day from the time of the service of such notice as aforesaid until such house, building, or other erection, or such part thereof, is altered, pulled down, or removed in accordance with the terms of such notice, and every such penalty shall be in addition to any other penalty for breach of any by-law.*

Provided always, that, notwithstanding the imposition and recovery of any penalty, the Council *at any time after default in compliance with the requirements of such notice, if they think proper, may cause complaint thereof*

to be made before a justice of the peace, who shall thereupon issue a summons requiring such occupier, builder, owner, or other person to appear at a time and place to be stated in the summons to answer such complaint, and if at the time and place appointed in such summons the said complaint is proved to the satisfaction of the justice before whom the same is heard, such justice may make an order in writing authorising the Council *to enter and alter, pull down, or remove such house, building, or other erection, or any part thereof, and do whatever may be necessary for such purpose, and also to remove the materials of which the same was composed to a convenient place, and (unless the expenses of the* Council *be paid to them within fourteen days) subsequently sell the same as they think proper; and all expenses incurred in respect of such entering and altering, pulling down, or removing any such house, building, or other erection, and in disposing of the said materials, may be deducted by the* Council *out of the proceeds of such sale, and the balance, if any, shall be paid by the* Council *to the person entitled thereto; and in case such materials are not sold by the* Council, *or in case the proceeds of the sale of the same are insufficient to defray the expenses incurred by the* Council *as aforesaid, the* Council *may recover such expenses or such insufficiency from such occupier, builder, owner, or other person, together with all costs and expenses in respect thereof, in like manner as if the same were a penalty imposed by this Act.*

Fence walls.

XIX. Fence walls built of concrete, brick, stone, or any similar substance, shall be constructed of the thickness and in such manner as is mentioned in Schedule No. . [First Schedule of Metropolitan Building Act, 1855.]

Walls.

XX. *Walls shall be constructed of such substances and of such thickness and in such manner* and with such recesses and openings as are mentioned in Schedule No. . [First Schedule of Metropolitan Building Act, 1855.]

Recesses and openings.

XXI. *The following rules* shall be observed with respect to recesses and openings in* external *walls:*

Recesses and openings may be made in external walls, provided:

(1) *That the backs of such recesses are not of less thickness than eight and a half inches;*

(2) *That the* superficies *of such recesses and openings* in any storey *do not, taken together, exceed one-half of the whole* superficies *of the wall* of such storey *in which they are made*; but the aforesaid limit of the recesses and openings shall not apply to that portion of an external wall between its base and thirty feet above the level of the public footway immediately in front of the centre of the façade, or, where there is no such footway, then above the actual level of the ground before excavation.

Recesses may be made in party walls, provided:

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* It is proposed that these rules shall be transferred to a Schedule.

(*a*) *That the backs of such recesses are not of less thickness than thirteen inches*; but in no case shall the back of such recess be within four inches of the centre of the said wall;

(*b*) That all recesses so formed are arched or corbelled over in the height of the storey in which they are made, and that the width of such recesses does not, taken altogether, exceed one-half of the whole length of the wall of the storey in which they are made; *and that such recesses do not come within one foot of the inner face of the external walls*; but such arches may be omitted where the recesses are used for the passage of a lift.

Uniting buildings.

XXII. *The following rules* shall be observed as to uniting buildings:*

(1) *No buildings shall*, except with the consent of the Council, *be united unless they are wholly in the same occupation.*

(2) *No buildings shall be united if when so united they will, considered as one building only, be in contravention of any of the provisions of this Act.*

(3) *No opening shall be made in any party wall* or in any two external walls *dividing buildings, which, if taken together, would contain more than two hundred and sixteen thousand cubic feet, except under the following conditions:*

There shall be no opening in such wall or walls on any one floor nearer than twenty-five feet to any other opening on the same floor;

Such opening shall not exceed in width seven feet, or in height eight feet;

Such opening shall have the floor, jambs, and head enclosing the space between the two doors *formed of brick, iron,* or other fire-resisting material, *and be closed by two wrought-iron doors, each one-fourth of an inch thick in the panel,* or by doors of other fire-resisting material, at a distance from each other of not less than eighteen inches, fitted to rebated frames of fire-resisting material; or if made to slide horizontally or vertically, then fitted to grooved frames of fire-resisting material, and made twelve inches wider and six inches higher than the openings, without woodwork of any kind.

Nothing herein contained shall prevent the formation in any such dividing wall or walls of holes for gas, water, steam, or other pipes, or for shafting or electric wires:

(4) *Whenever any buildings which have been united cease to be in the same occupation,* or whenever the conditions under which consent as aforesaid has been given for buildings not in the same occupation have been varied, then notice shall be given by the owner of such building to the district surveyor, and *any openings made in the party* or other *walls*

* It is proposed that these rules shall be transferred to a Schedule.

dividing the said buildings *shall be stopped up with brick* or other fire-resisting material *of the full thickness of the wall itself, and properly bonded therewith*; and the said dividing walls shall in all respects be restored to the condition in which they were prior to the uniting of the buildings:

Notice of cessation of such occupation shall be given to the district surveyor, and failing this, or failing to stop up the opening and to restore the said dividing wall, shall render the owner liable to a penalty not exceeding [sum to be named].

Provided always that the Council shall have power to exempt any building from the operation of this section or any part thereof.

Miscellaneous.

Advertisements on or in front of external walls.

XXIII. Except on hoardings enclosing buildings in progress, no advertisement, unless painted or pasted on a wall or window, shall be set up on the face or in front of the external wall of any building in any street, except on frames, tablets, plates, or other constructions of fire-resisting material throughout securely erected in accordance with by-laws to be made by the Council in pursuance of this Act, and no such advertisement shall be fixed to diminish the access of light to any habitable room.

Sky-signs.

XXIV. *For the purpose of giving effect to the provisions of* such parts of *this Act* as relate to sky-signs, *the district surveyor of each district shall inspect and survey sky-signs in his district, and report from time to time to the Council, or if his district be within the City of London to the Commissioners of Sewers, as to any sky-signs existing contrary to the provisions of this Act.*

Prohibition of future sky-signs.

XXV. *From and after the 3rd day of July* 1891 *it shall be unlawful to erect any sky-sign as defined in this Act within the administrative County of London.*

Regulation of existing sky-signs.

XXVI. *From and after the 3rd day of July* 1891 *it shall be unlawful to retain any sky-sign as defined in this Act which previously to the 3rd day of July* 1891 *shall have been erected within the administrative County of London, except in pursuance of and in accordance with the terms of a licence* granted or *to be granted by the Council, or by the Commissioners of Sewers, as the case may be, as hereinafter provided. But where application shall have been made for a certificate or licence as provided in this Act in respect of an existing sky-sign, no proceedings under this Act for the removal thereof shall be taken while the application is pending.*

Certificate as to existing sky-signs.

XXVII. (1) *Any person desiring to retain any existing sky-sign as defined in this Act, within the administrative County of London, may at any time within three months after the 3rd day of July* 1891 *make an application in writing to the surveyor for the district in which the sky-sign is situate for the inspection and survey of such sky-sign.*

(2) *The surveyor shall either grant a certificate that in his opinion the sky-sign is so placed, constructed, and supported as not to be likely to involve danger to the public, or he shall refuse to grant such certificate, in which case he shall state the grounds of such refusal, and such certificate or refusal shall be in the form set out in the Schedule following Section XXXVI of this Act, with such modifications, if any, as the circumstances may require.*

(3) *Every such application to the surveyor for a certificate with respect to a sky-sign shall be accompanied by a payment of two guineas to such surveyor, which shall be his fee for the inspection and survey and for the grant or refusal of the certificate, as the case may be, and it shall not be lawful for the surveyor to demand or receive any further fee or payment in respect thereof.*

Application to Council for licence.

XXVIII. *Any person who shall have obtained a certificate from the surveyor as to a sky-sign in accordance with Part I of the schedule following Section XXXVI of this Act may at any time within fourteen days from the issue thereof forward the same to the Council with an application for a licence from the Council to retain such sky-sign for the period hereinafter provided, and every such application for a licence shall be accompanied by a fee of five shillings, which shall be paid to the Council for and in respect of the registration of the licence, and the Council shall thereupon grant to such person a licence for the maintenance and continuance of such sky-sign for a period of two years from the date of issue of such licence, but such licence shall not confer any right or title to maintain or continue such sky-sign contrary to the provisions of any agreement, condition, or arrangement prohibiting or controlling the erection, maintenance, or continuance of such sky-sign. As regards the City of London, this section shall be read and have effect as if the Commissioners of Sewers were named therein instead of the Council.*

Renewal of licence.

XXIX. *Every such licence may be renewed from the expiration of the first period of two years for a further period of two years, and on the expiration of that period for one other period of two years, making with the original term of the licence six years in all, but not longer.*

Every person desirous of obtaining a renewal of a licence to retain a sky-sign for any such period as aforesaid may make application to the surveyor for a further inspection and survey of such sky-sign, and such application shall be dealt with in the same manner as the original application for a certificate, and the surveyor shall be entitled to a further fee of two guineas in respect thereof, and any person who shall have obtained a certificate from the surveyor after any such re-inspection and re-survey in accordance with Part I of the schedule following Section XXXVI of this Act may at any time within fourteen days from the issue thereof forward the same to the Council with an application for a licence from the Council to retain the same sky-sign, and every such application for a licence shall be accompanied by a fee of five shillings, which shall be paid to the Council for and in respect of the registration of the licence, and the Council

shall thereupon grant to such person a licence for the retention of such sky-sign for a period of two years from the date of the issue of such licence. As regards the City of London, this section shall be read and have effect as if the Commissioners of Sewers were named therein instead of the Council.

Alteration of sky-signs to meet surveyor's requirements.

XXX. (1) *Where the surveyor refuses to grant a certificate applied for under this Act the applicant may, if he think fit and can lawfully do so, execute such repairs to, or alterations in, or modifications of the sky-sign as shall meet the objections thereto as stated in the form of refusal, and may thereupon make a further application to the surveyor to inspect and survey the sky-sign.*

(2) *If the surveyor on re-inspection and re-survey be of opinion that the sky-sign has been so repaired, altered, or modified that it is not likely to involve danger to the public, he shall grant a certificate under this Act with respect to such sky-sign, and an application for licence thereof may be made as in this Act provided.*

(3) *Every such application to the surveyor to re-inspect and re-survey a sky-sign, and for a certificate in respect thereof, shall be accompanied by a payment of one guinea to such surveyor, which shall be his fee for such re-inspection and re-survey, and for the grant or refusal of a certificate thereupon as the case may be, and it shall not be lawful for the surveyor to demand or receive any further fee or payment in respect thereof.*

Notice of refusal of certificate to be sent to the Council.

XXXI. *Where the surveyor refuses to grant a certificate applied for under this Act, it shall be the duty of the surveyor forthwith to forward a copy of his refusal to the Council or to the Commissioners of Sewers as the case may be.*

Appeal against refusal of certificate.

XXXII. *Where the surveyor refuses to grant a certificate under this Act, it shall be lawful for the applicant at any time within fourteen days after the date of such refusal to make application to the Council by way of appeal against such refusal, and such appeal shall be accompanied by a copy of the form of refusal by the surveyor. Every such application by way of appeal shall be referred to the committee of appeal appointed by the Council under and in pursuance of Section CCXII of the Metropolis Management Act,* 1855, *who may hear and determine the same with all such powers as they have under Sections CCXI and CCXII of the said Act with regard to appeals therein mentioned, and such committee may if they think fit grant a licence for the retention of the sky-sign for any such period as by this Act provided, on such terms and conditions as they may think fit. As regards the City of London, this section shall be read and have effect as if the Commissioners of Sewers were named therein instead of the Council and the committee of appeal respectively, and as if Section CLXXXVIII of the City of London Sewers Act,* 1848, *were named therein, instead of sections CCXI and CCXII of the Metropolis Management Act* 1855.

Forfeiture of licence.

XXXIII. *In any of the following cases a licence under this Act shall become void, viz.:*

(1) *If any addition to any sky-sign be made except for the purpose of making it secure under the direction of the surveyor;*

(2) *If any change be made in the sky-sign or any part thereof;*

(3) *If the sky-sign or any part thereof fall either through accident, decay, or any other cause;*

(4) *If any addition or alteration be made to or in the house, building, or structure on, over, or to which any sky-sign is placed or attached, if such addition or alteration involves the disturbance of the sky-sign or any part thereof;*

(5) *If the house, building, or structure over, on, or to which the sky-sign is placed or attached become unoccupied or be demolished or destroyed.*

Penalties.

XXXIV. *Any person who shall place, erect, or retain any sky-sign contrary to the provisions of this Act, or who shall suffer or permit any such sky-sign to be placed, erected, or retained contrary to the provisions of this Act, shall be liable to a penalty of five pounds, and shall be also liable to a further penalty of forty shillings for every day on which the offence shall be continued after conviction thereof, and all such penalties shall be recoverable summarily.*

Removal of sky-signs.

XXXV. *If any sky-sign be erected or retained contrary to the provisions of this Act, or after the licence for the maintenance or retention thereof for any period shall have become void, it shall be lawful for the Council in any part of the administrative county other than the City of London, and for the Commissioners of Sewers of the City of London within the City of London, to take proceedings for the taking down and removal of the sky-sign in the same manner in all respects as if it were a structure which has been certified to be in a dangerous state under* Section * *of this Act, and it shall be lawful for the Council or the said Commissioners, as the case may be, or any officers, servants, or workmen appointed by them for that purpose (after obtaining the order of a justice for the taking down of the sky-sign in accordance with the provisions of* this *Act, and after the expiration of the period, if any, fixed by such order for taking down the same) to enter upon the land, building, or premises on or over which the sky-sign is erected, and to take down and remove the sky-sign, and to execute and do any works which may be necessary for that purpose, and for leaving any building to which the same was attached in a condition of safety, and all the expenses of and incidental to any such work shall be repaid and be recoverable in the same manner as expenses incurred in respect of a dangerous structure by virtue of the said* Section * *of this Act.*

For the purpose of any such proceedings the expression "the owner" in the said Section * *of this Act shall mean the occupier of the house, building, or structure on or to which the sky-sign is erected or attached, or if the house,*

* See Part II of the Metropolitan Building Act, 1855, and the Acts amending the same.

building, or structure is unoccupied, then the person who would be the owner thereof within the meaning of the Metropolis Management Act, 1855, *and the Acts amending the same.**

Payments under this part of the Act.

XXXVI. *All costs and expenses of the Council in the execution of* such parts of *this Act* as relate to sky-signs (*except so far as they may be otherwise provided for by this or any other Act*) *shall be defrayed as payments for general county purposes within the meaning of the Local Government Act,* 1888, *and the costs, charges, and expenses preliminary to and of and incidental to the preparing, applying for, obtaining, and passing of this Act shall be paid by the Council in like manner.*

All costs and expenses of the Commissioners of Sewers in the execution of this Act shall be paid out of their consolidated rate as part of the expenses of such Commissioners.

As to timber in external walls.

XXXVII. *Loophole frames* and all door frames, and doors of stables and coach-houses, may be fixed in any position not in advance of the external face of any external wall or other inclosure of a storey in which they are placed; but all other wood fixed in or to any external wall of a building, or of any portico, verandah, or other projection beyond such building (*except bressummers and storey posts under the same, and frames of doors and* woodwork of shop fronts of any building, and the facia board used for fixing metal gutters), *shall be set back four inches at the least from the external face of such wall,* in a rebate formed outside such wood in the material of which such wall is built.

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* The Schedule relating to this part of the Act, and referred to in the foregoing Sections XXVII, XXVIII, and XXIX.

Part I.—Form of Certificate.

District of

Whereas A. B. of *has made application to me pursuant to* Section XXVII [*or* XXIX] of the Metropolitan Building Act, 189 , *to inspect and survey a sky-sign erected at* *I hereby certify that I have inspected and surveyed the same, and in my opinion the said sky-sign may be retained as now constructed for two years from the date hereof without being likely to cause danger to the public.*

Dated this *day of* 189 .

(*Signed*) *C. D.*

Surveyor.

Part II.—Form of Refusal of Certificate.

District of

Whereas A. B. of *has made application to me pursuant to* Section XXVII [*or* XXIX] of the Metropolitan Building Act, 189 , *to inspect and survey a sky-sign erected at* *I hereby certify that I have inspected and surveyed the same, and I refuse to certify that the said sky-sign is so constructed as not to be likely to cause danger to the public for the following reasons :—*

Dated this *day of* 189 .

(*Signed*) *C. D.*

Surveyor.

Rules as to bressummers.

XXXVIII. *The following rules shall be observed with respect to bressummers and timbers:*

(1) *Every bressummer must have a bearing* in the direction of its length *of four inches at the least at each end, upon a sufficient pier of brick or stone, or upon a timber or iron storey post fixed on a solid foundation, in addition to its bearing upon any party wall,* and its minimum bearing in any case shall not be less than six inches at each end; *and the ends of such bressummer,* unless it be of iron, steel, or bronze, *shall not be placed nearer to the centre line of the party walls than four inches.*

(2) *Every bressummer bearing upon any wall must be borne by a templet or corbel of stone or iron tailed through at least half the thickness of such wall, and of the full breadth of the bressummer;* and every bressummer bearing on any external wall, or on the end of any party wall next an external wall, or on any storey post, shall be held back at each end by an iron strap at least four feet long, built into a wall where practicable, or, where that is not practicable, secured to joists or other sufficient attachment, to the satisfaction of the district surveyor. All wood posts or bressummers carrying walls to be coated with fire-resisting material.

(3) The ends of any beams or joists and the heads and sills of any wood partition bearing on any party wall shall be at least four inches distant from the centre of such wall, and no other timber except slips or plugs for fixing woodwork shall be built into any party wall. No bond timber except wall plates shall be built into any external or cross wall.

Height and thickness of parapets to external walls.

XXXIX. Except as hereinafter provided in the case of detached and semi-attached buildings, *if any gutter, any part of which is formed of* materials which are not fire-resisting, *adjoins an external wall, then such wall must be carried up so as to form a parapet one foot at the least above the highest part of such gutter, and the thickness of the parapet so carried up must be at the least eight and a half inches, reckoned from the level of the under-side of the gutter plate.*

Height and thickness of party walls above roof.

XL. Every party wall shall be, except as hereinafter provided, carried up to form parapets as follows, and the parapets shall be of the thickness required by this Act for the party wall of the topmost storey of the building:

(1) Above the roof, flat, or gutter of the highest building adjoining thereto, to such height as will give a distance, in the case of a building of the warehouse class, or of a public building, of at least three feet, and in the case of any other building of at least fifteen inches, measured at right angles to the slope of the roof, or above the highest part of any flat or gutter, as the case may be.

(2) Above any turret, dormer, lantern light, or other erection of materials which are not fire-resisting fixed upon the roof or flat of any

building within four feet from such party wall, and shall extend at the least twelve inches higher and wider on each side than such erection.

(3) Above any part of any roof opposite thereto, and within four feet from such party wall.

Provided always that if the highest building is, at the lowest part where it abuts on such party wall, ten feet above the highest part of the adjoining building where it abuts on such wall, or if such party wall forms the enclosure to a detached building against which the adjoining owner shall, on being so required by the building owner, state in writing that he does not contemplate building to within the said ten feet in height, then such part of the said wall as is above the said ten feet need not be carried above the roof, flat, or gutter of the highest building, but such roof, flat, or gutter shall not overhang or project outside the outer edge of such wall, and the flat or gutter so far as it rests on such wall shall be of iron or other fire-resisting material (as herein defined for construction), and shall be so constructed as to prevent the fall of any covering of such roof or of any snow on to the adjacent building, but if the adjoining building be at any time raised or subsequently built, or if the highest building be at any time lowered to within the said ten feet, then the said wall shall be carried up as hereinbefore provided.

In every case where the eaves, verges, barge-boards, and cornices (not constructed of fire-resisting material as aforesaid) of a roof project beyond the face of the building, every party wall against which such projection abuts shall be properly corbelled out in brickwork or other fire-resisting material to the full extent of such projection, and shall be carried up above the projecting eaves, of the thickness and to the height specified in this Section of the Act.

As to chases in party walls.

XLI. *In a party wall no chase shall be made wider than fourteen inches nor more than four and a half inches deep from the face of the wall, nor so as to leave less than* four *inches in thickness* to the centre of the party wall; *and no chase may be made within a distance of seven feet from any other chase on the same side of the wall.*

Construction of roofs.

XLII. *The roofs of buildings shall be constructed as follows, that is to say:*

(1) *The flat, gutter, and roof of every building, and every turret, dormer, lantern light, or other erection placed on the flat or roof thereof, shall be externally covered with* fire-resisting materials, except the cornices, dressings, and mouldings, the door frames, doors, windows, window frames, and skylights of such dormers, turrets, lantern lights, or other erections.

(2) The projecting eaves, verges, barge-boards, and cornices of any detached or semi-attached domestic building of classes A and B may be of wood, provided that the roof over the said eaves, verges, and barge-boards be

covered with, and the soffits of such eaves and verges be coated with, fire-resisting material, and that such wood be distant at least ten feet, measured horizontally, from any other building, and from any ground outside the curtilage of the said detached or semi-attached buildings. For the purposes of this sub-section a pair of semi-attached buildings shall be deemed to be a detached building, and the distance of ten feet shall not be requisite in respect of the relation of the aforesaid woodwork of one semi-attached building to the other of the pair.

(3) *The plane of the surface of the roof of any building* next to the external or party walls shall not incline *upwards at a greater angle than* eighty *degrees with the horizon.*

(4) Any building abutting on, or within four feet of, any street, having its roof on the side next such street covered with slate, tile, or other similar material, and having no parapet at the foot or eaves thereof, shall have attached to the eaves thereof an efficient guard made of fire-resisting material, to prevent any part of such covering from falling into such street.

Storeys in roofs.

XLIII. Two storeys and no more may be made in the roof of any building of the domestic class, and one storey and no more in the roof of a building of the warehouse class.

Chimney shafts from furnaces, &c.

XLIV. The width of a shaft from a furnace of any mill, factory, manufactory, printing works, brewery, or distillery shall be at the base, if square on plan, at least one-tenth, and if circular on plan at least one-twelfth of the total height.

The foundations and footings of every shaft shall be to the satisfaction of the district surveyor.

The brickwork shall be at least eight and a half inches thick at the top of the shaft and for twenty feet below, and shall be increased four inches in thickness for every twenty feet of additional height, measured downwards.

Every shaft shall have for a portion of its height a fire-brick lining, and such lining shall be in addition to the thickness of and independent of the brickwork.

No cornice or other projection shall project more than the thickness of the brickwork at the top of the shaft, unless with the consent of the Council.

Rules as to chimneys and flues.

XLV. *The following rules shall be observed as to chimneys and flues,* not being chimney shafts from furnaces of any mill, factory, manufactory, printing works, brewery, or distillery :

(1) *Chimneys built on corbels of brick, stone, or other* fire-resisting *materials may be introduced* if the work so corbelled out does not project from the wall more than the thickness of the wall of the storey in which they are built, *but all other chimneys shall be built on solid foundations, and with footings similar to the footings of the wall against which they are built.*

(2) Flues having proper soot doors of not less than six inches square may be constructed at any angle, but in every other flue the slope thereof shall never, except to form wind-bafflers, be at an angle of less than forty-five degrees with the horizon, and at every change of direction in such flue the work shall be properly rounded. All soot doors must be at least fifteen inches away from any timber or other combustible material.

(3) *An arch of brick or stone or a bar of wrought iron must be built over the opening of every chimney to support the breast thereof, and if the breast projects more than four and a half inches from the face of the wall, and the jamb on either side is of less width than seventeen and a half inches, the abutments must be tied in by an iron bar or bars turned up and down at the ends and built into the jambs for at least eight and a half inches on each side.*

(4) *The inside of every flue* must be rendered, or pargeted, or lined with fireproof piping, and on the building-owner's side the outer face of any brickwork of less thickness than eight and a half inches inclosing a flue or flues shall be so rendered of a thickness of not less than half an inch throughout its entire height from its lowest point to above the top of the roof covering.

(5) *The jambs of every* fireplace *must at the least be eight and a half inches wide on each side of the opening thereof.*

(6) The back of every flue (*a*) in a party wall shall not come within two inches of the centre of such wall for any part of its height below the top of the topmost storey; (*b*) in a cross wall or in any partition shall not be less than eight and a half inches thick, for a height of at least six feet above the level of the chimney bar; (*c*) every flue from a furnace, steam boiler, cockle, kitchener exceeding three feet in width, or other apparatus generating considerable heat, shall for its whole height below the roof-covering be inclosed with brickwork or other fire-resisting material of not less than eight and a half inches in thickness all round, except on the outer side in any external wall, or except in any withe separating it from another flue on the same side of the party wall, where the enclosure or withe may be not less than four inches in thickness.

The back of every fireplace opening from the hearth to a height of three feet above the chimney bar (*a*) in any party wall shall not come within four inches of the centre of such wall; (*b*) in any cross wall or partition shall not be less than eight and a half inches thick.

(7) Except as aforesaid, the brickwork of any chimney breast enclosing flues, the back of every fireplace opening, and the front, partition, and back of every flue, must at the least be four inches in thickness.

(8) *The thickness of the upper side of every flue, when its course makes with the horizon an angle of less than forty-five degrees, must be at the least eight and a half inches.*

(9) All flues shall, above the roof, be carried up in a casing of brick or other fire-resisting material at the least four inches thick all round, *to a height of not less than three feet* (*a*) *above any roof, flat, or gutter adjoining thereto, measured at the highest point in the line of junction with such roof, flat, or gutter;* and (*b*) above any roof, flat, or gutter opposite thereto, and within four feet thereof.

(10) *The brickwork or stonework of any chimney* stack *shall not be built higher above the roof, flat, or gutter adjoining thereto, measured from the highest point in the line of junction with such roof, flat, or gutter, than a height equal to six times the least width of such chimney* stack *at the level of such highest point in the line of junction, unless such chimney* stack *is built with and bonded to another chimney* stack *not in the same line with the first, or otherwise rendered secure;* and any metal flue pipe fixed on any chimney, against any party or external wall, shall, if it exceed eight feet in length, be properly secured to such wall.

(11) *There shall be laid* before the opening of every fireplace a hearth of stone, or other fire-resisting material, *at the least twelve inches longer than the width of such opening, and at the least eighteen inches wide in front of the* jambs *thereof;* similar hearths shall be laid under and within a distance of eighteen inches around any copper, hot-water boiler, or stove, whether used for domestic purposes or for the purpose of trade or manufacture.

(12) Every hearth shall be laid on a bed of brick, stone, or other fire-resisting material, and the thickness of such hearth and bed together shall be six inches at the least.

(13) *No flue shall be built against any party* wall or *structure unless the withes thereof are properly secured thereto, and are at the least four inches in thickness;* and if there be only four inches between the inner face of any existing flue and the outside of the said wall or structure against which it is proposed to build a new flue, a back at least four inches in thickness shall be constructed to the new flue against the flue in the said wall or structure, and the withes shall be properly bonded thereto.

(14) *No chimney breast or* stack *built with or in any party wall shall be cut away unless the district surveyor certifies that it can be done without injuriously affecting the stability of any building.*

(15) No chasing or toothing shall be made in any existing wall or structure for the back of a flue, or for the securing of a withe thereto within four inches of the inside of any existing flue in any such wall or structure.

(16) During the erection of a building no put-logs shall be inserted into any flue or within four inches of the inside thereof.

(17) *No timber or woodwork shall be placed*

In any wall or chimney breast nearer than twelve inches to the inside of any flue or fireplace opening, or any opening for a ventilator;

Under any fireplace *opening within eighteen inches* vertically *from the upper svrface of the hearth* thereof;

Under any copper, hot-water boiler, cockle, or stove within nine inches vertically from the upper surface of the hearth thereof.

Within two inches from the face of the brickwork or stonework about any chimney or flue where the substance of such brickwork or stonework is less than eight and a half inches thick, unless the face of such brickwork or stonework is rendered.

(18) *No wooden plugs shall be driven nearer than six inches to the inside of any flue or chimney opening, nor any iron holdfast or other iron fastening nearer than two inches thereto.*

Fires and pipes for conveying vapour, &c.

XLVI. *The following rules shall be observed as to close fires and pipes for conveying heated air, vapour, or water, that is to say:*

(1) No internal metal flue pipe shall extend beyond the storey of the room in which the stove (from whence it comes) is placed, and in any event shall not be of greater length than twenty feet.

(2) All metal flue pipes other than vertical ones shall be of cast or wrought iron or steel not less than three-eighths of an inch in thickness.

(3) *The floor under,* and for the space of eighteen inches around, *every oven or stove used for the purpose of trade or manufacture* shall be formed of fire-resisting materials.

(4) *No pipe for conveying smoke, heated air, steam, or hot water shall be fixed against any building on the face next to any street, alley, mews, or public way.*

(5) *No pipe for conveying air, steam,* or water at a temperature exceeding 212° Fahrenheit shall be fixed nearer than four inches to any combustible materials.

(6) *No pipe for conveying smoke or other products of combustion shall be fixed nearer than nine inches to any combustible material.*

Habitable and living rooms.

XLVII. *The following rules shall be observed with respect to* every habitable and living room, not being underground rooms, constructed to be let or occupied separately as a dwelling in any building:

(1) Every such room shall have one or more windows opening directly into the external air with a total superficies clear of the sash-frames equal to at least one-tenth of the floor area of the room, and so constructed that a portion equal to at least one-twentieth of such floor area can be opened, and the opening in each case shall extend to at least seven feet above the floor level, but a room having no external wall may be lighted through the

roof by a dormer window or lantern light having vertical sides. The opening in the ceiling and the area and superficies of the glass in such lantern light shall each be not less than one-twelfth the area of the room, and a portion of the vertical light not less than one-twentieth of such floor area shall open.

(2) Every such room hereafter constructed in any building, except rooms in the roof thereof, shall be in every part at the least eight feet in height from the floor to the ceiling.

(3) *Every habitable* or living room *hereafter constructed in the roof of every building shall be at the least seven feet in height from the floor to the ceiling throughout not less than one-half the area of such room.*

Habitable rooms in warehouses.

XLVIII. Any flat or other habitable rooms constructed in a building of the warehouse class shall be separated from the remainder of the building, so far as it or they adjoin vertically, by a wall or walls of fire-resisting material not less than nine inches thick, and so far as it or they adjoin horizontally by a floor or floors of fire-resisting material. If such flat or rooms be on a topmost storey, then the vertical inclosure shall be carried through the roof as a party wall unless the inclosure above, forming the ceiling, be of fire-resisting material.

Underground rooms.

XLIX. Every underground room constructed to be let or occupied separately as a dwelling shall be constructed in all respects to comply with the Public Health (London) Law Amendment Act, 1891, that is to say:

(1) *Any underground room which was not let or occupied separately as a dwelling before the* passing of this Act, *shall not be so let or occupied unless it possesses the following requisites, that is to say:*

(*a*) *Unless the room is in every part thereof at least seven feet high measured from the floor to the ceiling, and has at least three feet of its height above the surface of the street or ground adjoining or nearest to the room. Provided that, if the width of the area hereinafter mentioned is not less than the height of the room from the floor to the said surface of the street or ground, the height of the room above such surface may be less than three feet, but it shall not in any case be less than one foot, and the width of the area need not in any case be more than six feet.*

(*b*) *Unless every wall of the room is constructed with a proper damp-course, and, if in contact with the soil, is effectually secured against dampness from that soil.*

(*c*) *Unless there is outside of and adjoining the room and extending along the entire frontage thereof and upwards from six inches below the level of the floor thereof an open area properly paved at least four feet wide in every part thereof. Provided that in the area there may be placed steps necessary for access to the room, and over and across such area there may be steps necessary for access to any building above the underground room, if*

the steps in each case be so placed as not to be over or across any external window.

(*d*) *Unless the said area and the soil immediately below the room are effectually drained.*

(*e*) *Unless, if the room has a hollow floor, the space beneath it is sufficiently ventilated to the outer air.*

(*f*) *Unless any drain passing under the room is properly constructed of a gas-tight pipe.*

(*g*) *Unless the room is effectually secured against the rising of any effluvia or exhalation.*

(*h*) *Unless there is appurtenant to the room the use of a water-closet and a proper and sufficient ashpit.*

(*i*) *Unless the room is effectually ventilated.*

(*j*) *Unless the room has a fireplace with a proper chimney or flue.*

(*k*) *Unless the room has one or more windows opening directly into the external air with a total area clear of the sash-frames equal to at least one-tenth of the floor area of the room, and so constructed that one-half at least of each window of the room can be opened, and the opening in each case extends to the top of the window.*

(2) *Where two or more underground rooms are occupied together, and are not occupied in conjunction with any other room or rooms on any other floor of the same house, each of them shall be deemed to be separately occupied as a dwelling within the meaning of this section.*

(3) *Every underground room in which a person passes the night shall be deemed to be occupied as a dwelling within the meaning of this section; and evidence giving rise to a probable presumption that some person passes the night in an underground room shall be evidence, until the contrary is proved, that such has been the case.*

(4) Every other underground room shall be constructed in all respects to comply with the foregoing sub-section (1) *b*, *e*, *f*, *g*, *i*, *j*, and *k*, and with the following requirements:

(*l*) The room shall be in every part thereof at least eight feet high, measured from the floor to the ceiling.

(*m*) The earth or soil immediately below the floor area of the room shall be effectually drained.

(*n*) There shall be outside of the window or windows of such room, and extending to at least nine inches on each side of and across the width of such window, from six inches below the top of the sill thereof, an open area at least two feet wide in every part thereof, but there may be placed over such area a grating of open iron bars for the protection of passers by.

(*o*) The ceiling of such room shall be at least twelve inches above the

level of the footway of the adjoining street or of the ground adjoining or nearest to such window.

Party floors and floors over public ways.

L. Every party floor, and every *arch or floor over any public way, or any passage leading to premises in a* different *occupation, shall be formed of brick, stone, or other* fire-resisting *materials. If* a floor of *brick or stone is used, it shall, in cases where its span does not exceed nine feet, be of the thickness of* six *inches at the least, but when its span exceeds nine feet, be of the thickness of eight and a half inches at the least.* If concrete be used with or without iron, its minimum thickness shall be equal to that herein prescribed for brick arches. *If an arch or floor of iron or other* fire-resisting *material is used, it shall be constructed in such manner as may be approved by the district surveyor.*

Arches under public ways.

LI. The covering of every space *under any public way shall be formed of brick, stone, or other* fire-resisting *materials. If* a floor *of brick or stone is used, it shall, in cases where its span does not exceed ten feet, be of the thickness of eight and a half inches at the least; where its span does not exceed fifteen feet, it shall be of the thickness of thirteen inches at least; and where its span exceeds fifteen feet, it shall be of such thickness as may be approved by the district surveyor.* If concrete be used, with or without iron, its minimum thickness shall be equal to that herein prescribed for brick floors. *If* a floor *or other construction of iron or other* fire-resisting *material be used, it shall be constructed in such manner as may be approved by the district surveyor.* Provided always, that there may be formed in such floor openings covered with cellar flaps or lights, if permitted by the local authority.

Projections.

LII. *The following rules shall be observed as to projections:*

(1) The inclosures, supports, floor, and the covering of the roof of every bay window, portico, verandah, balcony, balustrade, and other structural projection beyond any external wall, and every coping, facia, window dressing, and other architectural decoration whatsoever, and every cornice or eaves (except as otherwise permitted in Section XLII) projecting beyond any such wall or beyond the external face of the inclosure of such window, portico, verandah, balcony, balustrade, or other structural projection, shall, unless the Council otherwise permit, be constructed of fire-resisting material, but the inclosure forming any shop front, and the cornice, dressings, or pilasters to any shop front may be of wood.

(2) *In streets of a less width than thirty feet,* any cornice of any such shop front may project beyond such shop front thirteen inches and no more over the street, and in any street or alley of a width greater than thirty feet, any such cornice may so project for eighteen inches but no more.

(3) *No part of the woodwork of any shop front* or of the cornice thereof or of any pilaster at the side thereof shall be fixed nearer than four inches from the centre of any party wall, and such woodwork shall to the full extent of the said four inches be protected by a pier or pilaster, and a corbel of

stone, brick, or other fire-resisting material, four inches wide at the least, built or fixed to a height of at least four inches above the top of such woodwork, and projecting an inch at least in front of the face thereof.

(4) *The roof, flat, or gutter of every building, and every balcony, verandah, shop front, or other projection, must be so arranged and constructed, and so supplied with gutters and pipes, as to prevent the water therefrom from dropping upon or running over any public way.*

(5) Every building owner may build over his own land in front of the general line of building a portico, verandah, balcony, shop front, bay-window, or other projection, provided that the construction shall be of fire-resisting material, except the door frames and doors, the window frames and sashes, and the shop front, and subject to the following conditions:

(*a*) Except with the consent of the adjoining owner, no part of such building shall come within two feet of the centre of the party wall or within an angle of 120° from the centre line of the party or of the external wall, where produced such line cuts the external face of the external wall.

(*b*) No part of such building shall project more than five feet.

(*c*) No part shall be within twenty feet of the centre of the street.

(6) *Except in so far as is permitted by this section in the case of shop fronts,* and except the projecting eaves, verges, barge-boards, and cornices of detached and semi-attached dwellings hereinbefore mentioned, *and with the exception of water pipes and their appurtenances,* and of *copings, cornices, facias, window dressings, and other like architectual decorations, no projection from any building shall extend beyond the general line of fronts in any street, except with the permission of the Council.*

Separation of buildings and limitation of their areas.

LIII. *The following rules shall be observed as to the separation of buildings and limitation of their areas:*

(1) *Every building shall be separated by external or party walls or party floors from any adjoining building.*

(2) No external wall shall be used as party wall unless it has been erected or is altered to conform with the provisions of this Act regarding party walls, and the onus of proving that it is so constructed shall be upon the owner of such wall, if he is desirous of its being so used.

(3) Whenever any building built for or in one occupation is divided vertically throughout its entire height from basement floor to top of topmost storey for the purpose of making it into, or letting it as, two or more buildings, each for separate occupation, with a separate entrance and separate staircase, it shall be divided by party walls as required by this Act.

(4) No opening shall be made in any external wall immediately adjoining or within six inches of any building above the level of the adjoining building which opening would, if the adjoining owner were to raise his

building to the height of the said external wall, be in contravention of this Act; and if any such opening be made contrary to this section, in such case it shall be lawful for such adjoining owner or the Council, and he or they are hereby entitled, to require the owner of such external wall to stop up such opening with such material as the said wall is built of, and if within one month after notice in writing has been given requiring him to stop up the said opening he neglects so to do, then it shall be lawful for such adjoining owner or the Council, and he or they are hereby entitled, by himself or his or their workmen, to cause such opening to be so stopped up, and the cost thereof shall be paid by the said owner.

(5) If any building having a floor area exceeding three thousand six hundred square feet, or containing more than fifty thousand cubic feet, is erected to be occupied in or is subsequently converted into two or more divisions intended for or adapted to be used as flats or domestic buildings of class A or B, or as buildings of the warehouse class, or is let or occupied in two or more such divisions, every such division of such building if exceeding the said floor area or the said cubic contents, shall be separated from every other division not in the same occupation vertically by party walls from the lowest floor to the ceiling of the topmost storey of such division, of the thickness required by Schedule and horizontally by floors and ceilings of fire-resisting material of not less thickness in any part than six inches, carried by supports of fire-resisting material, so that no such division of such building, if such division be in more than one occupation, shall contain a floor area exceeding three thousand six hundred feet or cubic contents exceeding fifty thousand feet; but every such division, or any flat or habitable room in a warehouse, may have an entrance door or doors of wood or any other material, whether fire-resisting or not, communicating with any lobby, hall, corridor, passage, landing, or staircase common to and outside the doors of two or more such divisions in such building. No such division in a warehouse, whether in one or more occupations, shall contain more than two hundred and sixteen thousand cubic feet. In measuring the floor area of any building for the purpose of this section, the floor area of any attached building, the height of which does not extend above the ground storey, shall be excluded.

(6) The floors of every lobby, hall, corridor, passage, or landing, and the flights of stairs referred to in the preceding sub-section, shall be of fire-resisting material, and carried by supports of such material, but such floors or flights of stairs or any of them may be covered by solid wood flooring laid directly on the said fire-resisting material without an air-space between.

Power to authorise larger buildings without party walls.

LIV. *A warehouse or other building used for the purposes of any trade or manufacture not involving the use of explosives or inflammable materials may, with the consent of the Council, contain any number of cubic feet exceeding two*

hundred and sixteen thousand, but not exceeding four hundred and fifty thousand, without being divided by party walls, or, if consisting of more than one division, every or any division thereof may with the like consent contain more than two hundred and sixteen thousand cubic feet, provided it do not contain more than four hundred and fifty thousand cubic feet.

But the Council shall not grant any such consent unless they are satisfied upon the report of the superintending architect and of the chief officer of the Fire Brigade that the additional dimensions are necessary for the purpose of the trade or manufacture carried on or intended to be carried on in the warehouse or buildings, and unless they are satisfied that proper arrangements have been or will be made and maintained for lessening, so far as reasonably practicable, danger from fire. Provided that in no case shall such consent be given in the case of buildings exceeding sixty feet in height. Provided also that such consent shall continue in force only during such time as the premises to which it relates are bonâ fide used for the purposes of the trade or manufacture in respect of which the same was granted.

Except as aforesaid, *every warehouse* or domestic *building* of class C *containing more than two hundred and sixteen thousand cubic feet shall be divided by party walls* or floors *in such manner that the contents of each division thereof shall not exceed two hundred and sixteen thousand cubic feet;* and if any addition be made to any building, or if any buildings, at whatever date either or both of them have been erected, be joined together so that the contents of the building and its addition, or of the buildings joined together, exceed the said two hundred and sixteen thousand feet, then the said buildings shall be divided as aforesaid.

Egress from certain buildings containing flats.

LV. Whenever any building containing flats is of a greater floor area above the ground floor than five thousand feet, and of a greater height than sixty feet, or where the greatest distance from the end of any corridor to a staircase in such building of such height exceeds sixty feet, or wherever any warehouse contains any flat or other habitable rooms, the staircase or staircases in such building shall be carried up to the roof, and a portion of such roof, in no part less than six feet wide, shall be constructed of fire-resisting materials, and shall be approximately level and protected at the sides by parapets or railings to afford a passage way to another staircase of fire-resisting material internal or external to the building (such external staircase may be in another building), and both such staircases shall communicate with the street or other open space to afford means of egress in the event of fire.

The height aforesaid shall be determined in manner hereinafter provided in the section limiting heights of buildings.

Lift shafts.

LVI. (1) All shafts for lifts penetrating floors constructed of fire-resisting material shall be separated from any flat or from any business

offices in a domestic building of class C by walls of fire-resisting material at least eight inches thick. All openings into such shafts from within the entrance door of any such flat (but not such offices) shall have at each storey from which access is given, in addition to any wooden doors, a door on one side of the wall of iron or other fire-resisting material, of construction similar to that required for doors for openings in party walls.

(2) Any inclosure to shafts for lifts or for the cylinders, balance-weights, or gearing of any lift outside the external wall of any building, shall be formed of brick of the minimum thickness specified in the Schedule for walls of buildings of the domestic building class, or of ironwork or other fire-resisting material, constructed to the satisfaction of the district surveyor. All openings into such inclosed shafts from within the entrance door of any flat contained in any building, the floors of which are required by this Act to be constructed of fire-resisting material, or from any warehouse or any domestic building of class C, the floors of which respectively are so required to be so constructed, shall have at each storey from which access is given, in addition to any wooden door, a door on one side of the external wall of construction similar to that required for doors in openings in party walls.

(3) All openings made for the passage of lifts through floors which are required by this Act to be constructed of fire-resisting material in buildings of the warehouse class, shall be fitted at each floor level with a horizontal door, hatchway, or other cover of iron or other fire-resisting material of not less thickness than that required for doors in openings in party walls.

Limiting height of buildings.

LVII. (1) *No building (not being a church or chapel, and not being a building contracted to be erected before the passing of this Act) shall be erected after the passing of this Act of a greater height than* seventy-five *feet (exclusive of two storeys,* not together exceeding the height of twenty feet, in the roof, and of ornamental towers, turrets, or other architectural features or decorations), *without the consent in writing of the Council, nor shall the height of any building be at any time subsequently increased so as to exceed the height of* seventy-five *feet (exclusive as aforesaid) without such consent. In determining the height of any such building, the measurement shall be taken from the level of the footway (if any) immediately in front of the centre of the façade or (where there is no such footway) from the natural level of the ground before excavation to the level of the top of the parapet, or where there is no parapet to the level of the top of the external vertical wall. Provided always, that in the case of gabled buildings the prescribed height of* seventy-five *feet (exclusive as aforesaid) shall be measured from the level of the footway immediately in front of the centre of the façade, or (where there is no such footway) from the natural level of the ground before excavation to the base of such gable.*

Provided always, that where any existing buildings, forming part of a continuous block of buildings, exceed the height prescribed by this section, any other building in the same block may be carried to a height equal to but not exceeding that of the existing buildings, anything in this section contained to the contrary notwithstanding.

Any person committing any offence under this enactment shall be liable to a penalty of one hundred pounds, and, in case of a continuing offence, to a further penalty of ten pounds for every day during which such offence shall continue after conviction, such penalties to be recovered by summary proceedings.

(2) *Notice of the consent to erect any building of a greater height than that prescribed by this section shall, within one week after such consent has been given, be published by the person to whom the consent is given in a London daily newspaper, and no consent shall be acted upon until twenty-one days after such notice.*

(3) *Any owner or lessee to whom consent may have been refused to erect a building of a greater height than that prescribed by this section may, within twenty-one days after the date of such refusal—and the owner or lessee of any building or land within one hundred yards of the site of any intended building of a greater height than that prescribed by this section who may deem himself aggrieved by the grant of any consent under this section, may within twenty-one days after notice of such grant shall have been published as aforesaid—appeal to the tribunal hereinbefore constituted, and such tribunal may confirm, reverse, or vary such refusal or grant, and may also determine any question which may arise as to the meaning of the word "block" in this section mentioned, and the costs of any such appeal shall be borne and paid as the said tribunal shall direct.*

(4) *This section shall not apply to the rebuilding to the same height as at present of any building existing at the passing of this Act of a greater height than* seventy-five *feet.*

(5) *Nothing in this section shall affect the exercise of any powers conferred upon any railway company by any special Act of Parliament for railway purposes.*

Open spaces near dwelling-houses.

LVIII. *Every building* upon a site occupied previously to the 19th day of June 1882, in whole or in part by a building *used or intended to be used as a* domestic building of class A, *unless all the rooms are lighted and ventilated from a street or alley adjoining, shall have in the rear or on the side thereon an open space exclusively belonging thereto of the extent at least of one hundred square feet.*

Every new building begun to be erected after the 19th day of June 1882, *upon a site not previously occupied in whole or in part by a building intended to be used wholly or in part as a* domestic building of class A, *shall, unless*

the Council *otherwise permit, have directly attached thereto and in the rear* or on the side *thereof an open space exclusively belonging thereto of* ten square feet in area for every foot of frontage of such building, but in no case shall such space be less than one hundred square feet in area, and such open space shall be in no part of less width than ten feet between the rear wall of such building and the rear boundary of the site.

In construing this section in the case of corner buildings fronting on two or more streets, the frontage of the building shall be deemed to be that face which is of least length.

Every such open space shall be free from any erection thereon above the level of the floor above the ceiling of the ground-floor storey, and shall extend throughout the entire width (exclusive of party or external walls) of such building at the rear thereof, but there may be erected above such level a lantern or skylight to such storey, but such light shall not exceed five feet in height above such level.

Provided always, that in the event of there being in any building an underground room used as a living or habitable room in the rear of such building, such room shall have a window or skylight directly opening into the open air, and if these or either of them can only be obtained opening into such open space, then there shall be no erection above the sill of such window, or the roof of such living or habitable room, as the case may be.

Drains and sanitary apparatus.

LIX. *Every building* constructed after the passing of this Act shall have gas-tight drains for carrying away water and soil, with inspection chambers or other means of ready access to such drains for cleansing them, and shall also have gas-tight pipes for carrying away soil and other liquid refuse, and provision shall be made for the efficient ventilation of such drains and pipes. All pipes for carrying away rain-water or water from lavatories, baths, sinks, safes, and cisterns shall be disconnected where possible from all drains. The Council shall from time to time make by-laws as hereinafter provided in respect of all the foregoing, and of water-closet and other apparatus, water-supply, and other matters to protect the health of persons using such buildings, so that such by-laws be in no way repugnant to the Public Health (London) Act, 1891, or any amendment thereof.

The Council may annex and enforce conditions as to space to be left open where building is erected beyond the general or

LX. *Where the* Council *consent in writing, under Section* * *of this Act, to the erection by any person of a building or part of a building or erection in any street, place, or row of houses beyond the general or regular line of buildings in such street, place, or row of houses, the* Council *may annex to such consent, if they think fit, any condition they may think proper as to the amount of land in front of such building, part of a building, or erection which shall be dedicated to or left open for the use of the public; and where the*

* See Section LXXV of the Metropolis Management Amendment Act, 1862.

regular line of building.

Council *have annexed to such consent to the erection of such building, part of a building, or erection any such condition, then and in every such case such condition shall, within three months after the erection of such building, part of a building, or erection, be fulfilled, and if such person fails to fulfil such condition within such period as aforesaid, he shall be liable to a penalty not exceeding five pounds, and to a further penalty not exceeding forty shillings for every day upon which such condition continues to be unfulfilled after the day on which the first penalty is incurred.*

Provided always, that notwithstanding the imposition and recovery of any penalty under this section, the Council, *at any time after default in the fulfilling of any such condition, may cause complaint thereof to be made before a justice of the peace, who shall thereupon issue a summons requiring the owner or occupier of such building, part of a building, or erection, at a time and place to be stated in the summons, to answer such complaint, and if at the time and place appointed in such summons the said complaint is proved to the satisfaction of the justice before whom the same is heard, such justice shall make an order in writing on such owner or occupier, directing the demolition of such building, part of a building, or erection, or so much thereof as may be beyond such general or regular line, within such time as such justice shall consider reasonable, and shall also make an order for the costs incurred up to the time of the hearing; and in default of the building, part of a building, or erection complained of being demolished within the time limited by such order, the* Council *may forthwith enter the premises to which the order relates and demolish the building, part of a building, or erection complained of, and do whatever may be necessary to execute such order, and may also remove the materials of which the same was composed to a convenient place, and (unless the expenses of the* Council *be paid to them within fourteen days after such removal) sell the same as they think proper; and all expenses incurred by the* Council *in executing such order and in disposing of the said materials may be deducted by the* Council *out of the proceeds of such sale, and the balance, if any, shall be paid by the* Council *on demand to the person entitled thereto; and in case such materials are not sold by the* Council, *or in case the proceeds of the sale of the same are insufficient to defray the expenses incurred by the* Council *as aforesaid, the* Council *may recover such expenses or such insufficiency from such owner or occupier, together with all costs and expenses in respect thereof, in like manner as if the same were a penalty imposed by this part of this Act.*

Power to Council to exercise powers of Vestries and District Boards under s. 75 of 25 & 26 Vict. c. 102,

LXI. *The powers conferred by the* 75*th section of the Metropolis Management Amendment Act,* 1862, *upon the vestry of any parish and the board of works of any district with respect to any building or erection situate in such parish or district in case such building or erection has been erected, or begun to be erected or raised, beyond the general line of buildings in the street, place, or rows of houses in which the same is situate without the consent in*

with respect to buildings, &c., erected beyond general line of buildings.

writing of the Council, *or contrary to the terms and conditions on which such consent may have been granted (including the powers for the recovery of expenses), shall extend and apply to and may be exercised by the* Council *in like manner as by such vestry or board of works.*

Erection of houses or buildings at less than prescribed distance from centre of roads, passages, or ways being highways.

LXII. *No house or building begun to be constructed after the* 22*nd day of July* 1878, *shall be constructed or begun to be constructed, and no house or building shall be extended or begun to be extended, in such manner that the external wall or front of any such house or building, or, if there be a forecourt or other space left in front of any such house or building, the external fence or boundary of such forecourt or other space, shall be at a distance less than the prescribed distance from the centre of the* street, *whether a thoroughfare or not, being a highway, without the consent in writing of the* Council. *Provided always, that the* Council *may, in any case where they think it expedient, consent to the construction, formation, or extension of any house, building, forecourt, or space at a distance less than the prescribed distance from the centre of the* street, *and at such distance from the centre of such* street, *and subject to such conditions and terms (if any) as they may think proper to sanction.*

In euery case where any such house, building, forecourt, or space is constructed, formed, or extended, or is begun to be constructed, formed, or extended, in contravention of the provisions of this section at a distance from the centre of the street *of any such road, passage, or way as aforesaid less than the prescribed distance, or than such other distance as may have been sanctioned by the* Council, *or contrary to the conditions and terms (if any) subject to which such sanction was obtained, the* Council *may serve a notice upon the owner or occupier of the said house, building, forecourt, or space, or upon the builder or person engaged in constructing, forming, or extending the same, requiring him to comply with the provisions of this section, and to cause such house, building, forecourt, or space, or any part thereof, to be set back so that the external wall of such house or building, or the external fence or boundary of such forecourt or space, shall be at a distance not less than the prescribed distance from the centre of the* street *of such road, passage, or way as aforesaid, or at such distance and according to such conditions and terms (if any) as the* Council *may have sanctioned.*

Provided always, that the preceding provisions of this section shall not affect the construction or extension of any house or building within the limits of any area which may have been lawfully occupied by any house or building at any time within two years before the said 22*nd day of July* 1878, *or the construction or extension of any house or building lawfully in course of construction or extension on the said* 22*nd day of July* 1878 ; *and provided also, that the construction or extension of any house or building in or abutting upon any street existing, formed, or laid out for building at the said* 22*nd day*

of July 1878, *may be begun and completed in like manner in every respect as if the preceding provisions of this section had not been made.*

Erection of houses or buildings at less than prescribed distance from centre of roads, passages, or ways not being highways.

LXIII. *Where, after the* 22nd day of July 1878, *any house or building begun to be constructed after the said* 22nd day of July 1878, *is constructed, or is begun to be constructed, or any house or building is extended or begun to be extended, in such manner that the external wall or front of any such house or building, or if there be a forecourt or other space left in the front of any such house or building, the external fence or boundary of such forecourt or space, is at a distance from the centre of the roadway of any road, passage, or way (not being a highway) less than the prescribed distance or less than such other distance as may have been sanctioned by the* late *Board* or by the Council *as hereinafter provided, or where, in relation to any such house, building, or forecourt, or space constructed, formed, or extended at such less distance than the prescribed distance with the sanction of the* late *Board* or of the Council *as aforesaid, the conditions or terms (if any) subject to which such sanction was obtained have not been complied with, or the time during which such sanction was limited to continue has expired, then and in every such case, where it is intended that such road, passage, or way shall become a highway, a written notice to that effect shall be served upon the* Council, *and thereupon the* Council *may at any time within two months after the receipt of such notice serve a notice upon the owner or occupier of such house, building, forecourt, or space, or the builder or person engaged in constructing, forming, or extending the same, requiring him to cause the same, or any part thereof, to be set back so that the external wall or front of such house or building, or the external fence or boundary of such forecourt or space, shall be at a distance not less than the prescribed distance from the centre of the roadway of such road, passage, or way, or at such distance and according to such conditions and terms (if any) as the* Council *may have sanctioned, and unless and until such first-mentioned notice has been given to the* Council, *and such last-mentioned notice (if any) has been complied with, such road, passage, or way shall not become a highway.*

The Council *may consent to the construction, formation, or extension of any house, building, forecourt, or space at any lesser distance than the prescribed distance from the centre of the roadway of any such road, passage, or way (not being a highway) as aforesaid, to be specified in such consent, or to the continuance of any house, building, forecourt, or space constructed, formed, or extended at such lesser distance, or to the continuance thereof for a limited time only, to be specified in such consent, in such cases and subject to such terms and conditions (if any) as they may think proper.*

Provided always that the preceding provisions of this section shall not affect the construction or extension of any house or building within the limits of any area which may have been lawfully occupied by any house or building at any time within two years before the passing of this Act, or the construction or

extension of any house or building lawfully in course of construction or extension at the time of the passing of this Act.

As to extension of any part of a building within certain distance from centre of street.

LXIV. *No person shall after the* 18th day of August 1890, *extend any building, structure, or erection upon a site not previously occupied in whole by a building in such manner that any part of the external wall of such extension shall be in any direction at a less distance than twenty feet from the centre of any* street *used as a public carriage way, or than ten feet from the centre of any public footway used for foot traffic only* (*not being an approach, road, passage, or way to a single private dwelling-house*) *without the consent in writing of the* Council, *and the* Council *may give their consent subject to such conditions and limitations as the* Council *may think proper to prescribe.*

If any person shall, without the consent in writing of the Council, *extend or begin to extend any such building, structure, or erection, in such manner that any part of the external wall thereof shall be at a distance less than twenty feet from the centre of any* street *used as a public carriage way, or than ten feet from the centre of any public footway used for foot traffic, or without conforming to the conditions and limitations which the* Council *have thought proper to prescribe, he shall be liable to a penalty not exceeding five pounds, and to a further penalty not exceeding forty shillings for every day on which such offence shall continue after conviction thereof, such penalties to be recovered by summary proceeding.*

Nothing in this section shall affect the exercise of any powers conferred upon any railway company by any special Act of Parliament.

Proceedings in case of default in compliance with requirements of notice.

LXV. *In case any owner, occupier, builder, or person during twenty-eight days after the service of any notice under Section* LXIII *of this Act neglects or refuses to comply with the requirements of such notice, or after the expiration of such period fails to carry out or complete the works necessary for such compliance with all reasonable despatch, the* Council *may cause complaint thereof to be made before a justice of the peace, who shall thereupon issue a summons requiring such owner, occupier, builder, or person to appear at a time and place to be stated in the summons to answer such complaint, and if at the time and place appointed in such summons the said complaint is proved to the satisfaction of the justice before whom the same is heard, such justice shall make an order in writing on such owner, occupier, builder, or person, directing him to comply with the requirements of such notice within such time as such justice may consider reasonable, and such justice shall also make an order for the payment of the costs incurred up to the time of hearing, and of hearing; and in case such owner, occupier, builder, or person makes default in complying with the requirements of such notice within the time limited by such order, he shall be liable to a penalty of not less than forty shillings and not more than five pounds, and to a further penalty of not less than ten shillings and not more than forty shillings for each day during which such default continues after the*

first day after the expiration of the time limited by such order for compliance with the requirements of such notice. Provided always, that this section shall not apply to any non-compliance with the notice of the Council *in the case of an intended highway where the same shall not be opened as a highway.*

Appeal against certificate of architect as to general line of buildings.

LXVI. *The superintending architect shall within fourteen days after certifying, under the powers of the Metropolis Management Act,* 1855, *and the Acts amending the same, the general line of buildings in any street, place, or row of houses, cause a notice of his certificate to be given to or served on the vestry or district board of the parish or district, and to be given to or served on the owner of the building or land in reference to which the general line of buildings has been certified, and on the owner of the next adjoining houses or land upon each side of the building or land in reference to which the general line of buildings has been certified.*

And such notice may be given or served in accordance with the provisions of Section of this Act.*

The vestry or district board, or any person deeming himself aggrieved by the certificate of the superintending architect, may, within fourteen days after notice of such certificate has been given or served, appeal to a tribunal to be constituted as hereinafter provided :

One member to be from time to time appointed by the Council;

One member (who shall not be a member or officer of the Council) to be from time to time appointed by the Council of the Royal Institute of British Architects; and

One member (who shall not be a member of or officer of the Council) to be from time to time appointed by the Council of the Surveyors' Institution.

And every such appeal shall stand referred to such tribunal, who shall have power, after hearing the superintending architect and all other persons interested who may deem themselves aggrieved, to confirm or reverse or vary such certificate, and the decision of such tribunal, whether it confirms or reverses or varies such certificate, shall finally determine the general line of buildings, and the costs of any of the parties to such appeal shall be in the discretion of the tribunal.†

Buildings abutting on more than one street.

LXVII. *The superintending architect to the* Council *for the time being shall, in setting out the general line of building in any street, place, or row of houses, decide so far as affects any building, structure, or erection to be erected after the* 18th day of August 1890, *other than on the site of a building, or on land held with building existing on the* said 18th day of August 1890, *or on*

* See Section XCVIII of the Metropolitan Building Act, 1855.

† Add to this Section provision for payment of the costs of the tribunal.

land laid out for building before the said 18th day of August 1890, *and which will abut on any other street or streets, place or places, or row or rows of houses, the general line of building in such other street or streets, place or places, or row or rows of houses, and no building, structure, or erection to be erected after the* said 18th day of August 1890, *shall, without the consent in writing of the* Council, *be erected beyond the general line of building in such other street or streets, place or places, or row or rows of houses in case the distance of any such general line of building from any highway does not exceed fifty feet or within fifty feet of any highway when the distance of any such general line of building therefrom amounts to or exceeds fifty feet, notwithstanding there being gardens or vacant spaces between the general line of buildings and any highway, and in case any building, structure, or erection be erected, or be begun to be erected or raised, after the* said 18th day of August 1890, *without such consent, or contrary to the terms and conditions on which the same may have been granted, the owner or occupier of the premises or the builder shall be deemed to be engaged in a work contrary to the provisions of section* 75 *of the Metropolis Management Act*, 1862, *and it shall be lawful for the* Council, *the vestry of the parish, or the district board for the district in which such building, structure, or erection is situate, to take proceedings against such owner or occupier or builder under the provisions of the said section.*

Provided that any such certificate may be appealed against to the tribunal constituted under Section LXVI *of this Act, and that if any dispute shall arise between any owner of land alleged to be laid out as building land and any other person as to whether the same was in fact laid out for building at the time of the passing of this Act, so as to justify objection to the line set out by the superintending architect, the same shall be settled by the same tribunal, and such tribunal shall decide such dispute in their discretion as a matter of fact, and all the provisions of the said section as to costs and otherwise shall apply to any appeal under this section.*

Nothing in this section shall affect the exercise of any powers conferred upon any railway company by any special Act of Parliament.

Construction of public buildings.

LXVIII. In every public building the following matters shall be subject to the approval of the superintending architect:—

(1) The width of lobbies, corridors, passages, and stairs, and the freedom thereof from inconvenient barriers and from steps of narrow tread or of objectionable curve.

(2) The construction thereof with fire-resisting materials carried by supports of such materials.

(3) The strength and security of the railings and balustrades.

(4) The number and width of openings for doors for public entrance, or access, or egress, and the method of securing and opening same.

(5) The means of ventilation.

(6) Provision for water-supply by constant service where practicable, or otherwise.

(7) Provision for extinction of fire.

The Council shall have power to make by-laws as hereinafter provided in relation to the matters aforesaid, and to the use, inspection, and maintenance thereof.

Notwithstanding anything herein contained, every public building, including the walls, roofs, floors, galleries, and staircases, shall be constructed in such manner as may be approved by the district surveyor, or, in the event of disagreement, may be determined by the Council, and particularly all doors for egress shall be hung to open outwards. The floor of every lobby, hall, corridor, passage, and landing, and the flights of stairs in such public building, shall be of fire-resisting material, but such floors and flights of stairs, or any of them, may be covered with solid wood flooring, laid directly on the said fire-resisting material without an air-space between. *And, save in so far as respects the rules of construction, every public building shall throughout this Act be deemed to be included in the term building, and be subject to all the provisions of this Act, in the same manner as if it were a building erected for a purpose other than a public purpose.*

Power to Council in certain cases to require proprietors of theatres and certain music-halls in use at the time of the passing of this Act to remedy structural defects.

LXIX. *Whenever it appears to the* Council *that any house or other place of public resort within the Metropolis which was*, on the 22nd day of July 1878, *authorised to be kept open for the public performance of stage plays, and which is kept open for such purpose, under the authority of letters patent foom Her Majesty, her heirs and successors, or predecessors, or of a licence granted by the Lord Chamberlain of Her Majesty's Household for the time being, or by justices of the peace, or that any house, room, or other place of public resort within the Metropolis containing a superficial area for the accommodation of the public of not less than five hundred square feet, which was at the time of the passing of this Act authorised to be kept open, and which is kept open, for dancing, music, or other public entertainment of the like kind, under the authority of a licence granted by any court of quarter sessions, is so defective in its structure* or is provided with insufficient or dangerous accesses or staircases, or has such sanitary defects that danger *may result to the public frequenting the same, then and in every such case the* Council, *may, with the consent of the Lord Chamberlain in the case of theatres under his jurisdiction, and of Her Majesty's principal Secretary of State in all other cases, if in the opinion of the Council such defects can be remedied at a moderate expenditure, by notice in writing require the owner of such house, room, or other place kept open for any of the purposes aforesaid, under such authority as aforesaid, to make such alterations therein or thereto as may be necessary to remedy such defects within a reasonable time to be specified in such notice; and in case such owner fails to comply with the requirements of such notice*

within such reasonable time as aforesaid, he shall be liable to a penalty not exceeding fifty pounds for such default, and to a further penalty of five pounds for every day after the first day after the expiration of such reasonable time as aforesaid during which such default continues. Provided always, that any such owner may, within fourteen days after the receipt of any such notice as aforesaid, serve notice of appeal against the same upon the Council, *and thereupon such appeal shall be referred to an arbitrator to be appointed by Her Majesty's First Commissioner of Works at the request of either party, who shall hear and determine the same, and may, on such evidence as he may think satisfactory, either confirm the notice served by the* Council, *or may confirm the same with such modifications as he may think proper, or refuse to confirm the same, and the decision of such arbitrator with respect to the requirements contained in any such notice, and the reasonableness of the same, and the persons by whom and the proportions in which the costs of such arbitration are to be paid, shall be final and conclusive, and binding upon all parties.*

In case of an appeal against any such notice, compliance with the requirements of the same may be postponed until after the day upon which such appeal shall be so decided as aforesaid, and the same, if confirmed in whole or in part, shall only take effect as and from such day.

Power to Council to make regulations with respect to new theatres and certain new music-halls for safety of public.

LXX. *The* Council *may from time to time make, alter, vary, and amend such regulations as they may think expedient with respect to the requirements for* the safety of the public *in houses or other places of public resort within the Metropolis to be kept open for the public performance of stage plays, and of houses, rooms, or other places of public resort within the Metropolis containing a superficial area for the accommodation of the public of not less than five hundred square feet, to be kept open for public dancing, music, or other public entertainment of the like kind, under the authority of letters patent from Her Majesty, her heirs and successors, or of licences by the Lord Chamberlain of Her Majesty's Household, or by any justices of the peace, or by any court of quarter sessions, which may be granted for the first time after the passing of this Act; and may by such regulations prescribe the requirements as to position and structure of such houses, rooms, or places of public resort which may, in the opinion of the* Council, *be necessary for the protection of all persons who may frequent the same against dangers from fires which may arise therein or the neighbourhood thereof. Provided that the* Council *may from time to time in any special case dispense with or modify such regulations, or may annex thereto conditions if they think it necessary or expedient so to do.*

The Council *shall, after the making, altering, varying, or amending of any such regulations, cause the same to be printed, with the date thereof, and a printed copy thereof shall be kept at the office of the* Council, *and all persons may at all reasonable times inspect such copy without payment, and the*

Council *shall cause to be delivered a printed copy, authenticated by their seal, of all regulations for the time being in force to every person applying for the same, on payment by such person of any sum not exceeding five shillings for every such copy.*

A printed copy of such regulations, dated and authenticated by the seal of the Council, *shall be conclusive evidence of the existence and of the due making of the same in all proceedings under the same, without adducing proof of such seal or of the fact of such making.*

From and after the making of any such regulations it shall not be lawful for any person to have or keep open any such house, room, or other place of public resort for any of the purposes aforesaid, unless and until the Council *grant to such person a certificate in writing under their seal, to the effect that such house, room, or other place was on its completion in accordance with the regulations made by the* Council *in pursuance of the provisions of this Act for the time being in force, and in so far as the same are applicable to such house or other place, and to the conditions (if any) annexed thereto by the* Council.

In case any such house, room, or place of public resort is opened or kept open by any person for any of the purposes aforesaid contrary to the provisions of this enactment, such persons shall be liable to a penalty not exceeding fifty pounds for every day on which such house or place of public resort is so kept open as aforesaid.

Provisional licence of new premises.

LXXI. *A person interested in any premises about to be constructed, or in course of construction, which are designed to be licensed and used within the Metropolis for the public performance of stage plays, or for public dancing, music, or other public entertainment of the like kind, may apply to the licensing authority for the grant of a provisional licence in respect of such premises. The grant of such provisional licence shall, in respect of the discretion of the licensing authority and procedure, be subject to the same conditions as those applicable to the grant of a like licence which is not provisional. A provisional licence so granted shall not be of any force until it has been confirmed by the licensing authority; but the licensing authority shall confirm the same on the production by the applicant of a certificate by the* Council *that the construction of the premises has been completed in accordance with the regulations and conditions made by the* Council *as hereinbefore provided, and on being satisfied that no objection can be made to the character of the holder of such provisional licence.*

Conversion of houses, &c., into public buildings.

LXXII. *Where it is proposed to convert or alter any building erected for a purpose other than a public purpose into a public building, such conversion or alteration, and the public building thereby formed, including the walls, roofs, floors, galleries, and staircases of the same, shall be carried into effect and constructed respectively in such manner as may be approved by the district surveyor, or in the event of disagreement may be determined by the* Council,

and the provisions of this Act *with respect or applicable to the construction of public buildings shall extend and apply to such alteration or conversion as though such alteration or conversion were the construction of a public building*, and in the event of its being proposed to use as a public building any building erected for a purpose other than a public purpose, such proposal shall be communicated in writing to the district surveyor, and such building shall be altered as aforesaid, or strengthened in such manner as shall be approved by the district surveyor, or in the event of disagreement as may be determined by the Council.

_ A new section, based on Section XVI of the Metropolis Management and Building Acts Amendment Act, 1878, should be drawn to give power to the Council to make by-laws in respect of matters mentioned in that section; also of those mentioned in Section XXXI (2) of the London Council (General Powers) Act, 1890; also of those mentioned in various sections of this Draft, and particularly in reference to "the extent and "form of the accesses and exits, and provision for sanitary and other "arrangements for the safety of the public and persons employed in public buildings;" also to embrace the substance of Section LXVII of the Act of 1855 (to apply to applications in respect of irregular buildings under Section LVI of that Act, and Section XII of the Act of 1882); and include Section XXVII of the Act of 1890, and state a limit of time within which the Council shall express approval or disapproval of applications. When application is disapproved, the grounds of disapproval should be stated.

Power should also be given to the Commissioners of Sewers to make by-laws of a similar character on such matters or buildings as are within their jurisdiction, and are excluded from that of the London Council.

Power should be given generally to the Council to dispense with any of the provisions of the Act, except where in any part of the Act it is expressly provided that the Council shall not have a dispensing power, or where limits are imposed on any such power.

In matters involving construction, which are to be to the satisfaction of the district surveyor, an appeal should be allowed to the tribunal constituted by Section XXVIII of the London Council (General Powers) Act, 1890, which section is incorporated as Section LXVI of this Draft.

In the subsequent portion of the proposed Act many modifications of the Metropolitan Building Act, 1855, will be required consequent on the foregoing revision of the first part, as well as on the merits of the sections themselves.

ABSTRACT OF THE DISCUSSION.

Mr. H. H. COLLINS (*F.*) said that many of the suggestions, made by Mr. Hall in his Paper, and in the Committee's Draft Bill, had occupied the attention of other bodies besides the Institute, and he had been fearful that he should hear an exposition of new principles, new ideas, and new methods altogether. He was glad to find that it was not so; for an Act which had borne the test of thirty years' hard experience, and had not been found wanting in its main principles, was one which deserved the credit that it had gained. They did not want over-legislation, and they did not want to go to school again. Architects, builders, clerks of the works, and others who had to carry out building legislation had had their minds pretty well saturated with the legislation of thirty-six years; and he hoped that by the admirable amendments suggested by Mr. Hall they would jog on again perhaps for another thirty years. One very vexed question—the regulations for the footings of party walls upon each side of the same, which it was almost impossible to carry out in practice, leaving, as it would, an insanitary space between the houses—he hoped would be solved as admirably as had been the case with other difficulties. Then he was pleased to find that another question had been considered which vexed them (at all events in the City of London), that of right of light, where they had to set back the buildings in stages; respecting which, some district surveyors had taken objection as regarded method of construction, on the ground that the walls should be built upon solid substructure, which they considered could only mean the earth. The consequence was that they got bad buildings because they got lath and plaster over iron joists, and that of a character very much to be avoided. He warned all those who were advocating a new or amended Bill not to weight the ship with too much cargo, or they might find themselves on a rock and the ship would go to pieces, as it did in 1884 when the Metropolitan Board of Works tried to carry a Bill which contained a great many good propositions, the objections to which became more hydra-headed every day, until at last the Metropolitan Board, having found that they had an emasculated measure, thought it better to leave things as they were. That would be again the case if they were too eager to obtain an excess of legislation.

Mr. ARTHUR BAKER (*F.*) had hoped to hear something about fireproof construction, but there was very little about it in Mr. Hall's Paper. It was a disgrace to London to have a Building Act which allowed large buildings of brick and stone to be perched in the air on iron legs, and he had a great hope that in a new Building Act such structures would be impossible. But there was nothing in the suggestions which led him to suppose that this new Building Act would prevent such a structure. It was a most important subject, and one that ought to be fully dealt with. He had been very glad to hear so much about lifts, but the subject of building such dangerous structures as those to which he had referred should also be considered.

Mr. ALEXANDER PAYNE (*F.*) was almost alarmed at the elaborate detail into which Mr. Hall had gone, in everything that could be considered in the whole range of the Building Acts. Having had partly to administer the Acts, he (Mr. Payne) knew what a very difficult thing it was, in the first place, to know exactly what the Act meant, and, after that, to find out what lawyers might make it to mean; and he rather dreaded such changes as the Draft would make. There was so much detail in it that it was necessary to read it through with care, and to study it before it could be properly criticised.

Mr. RALPH NEVILL, F.S.A. (*F.*), heard with great satisfaction such strict rules laid down with regard to the formation of flues from kitcheners. Most of them had come across instances in which the modern kitchener blackened the walls of the next house through the plaster in a way that evidently suggested danger, which applied not only to kitcheners, but to many of the new-fashioned grates. Some of the fire-brick grates rendered the wall on the opposite side intensely and dangerously hot; and as one did not know what new invention the future might bring forth, or that any flue in a house might not become converted into a dangerous flue, he thought that all flues required equal precautions to those for kitcheners. Mr. Hall appeared to see no objection to projecting windows being brought out over the building owner's own land beyond the line of frontage, not only at a limited height above the pavement, as contemplated by the County Council, but down to the ground. That seemed open to objection: if bow-windows were brought down to the ground, why not bring the whole front out, and down to the ground? A bow-window might be so big that it would be practically like bringing the whole building out. Therefore, for that reason alone, it seemed not a desirable thing, because it would impede the passage of air and the sense of freedom in the streets. He did not know whether the Committee had yet taken into consideration the schedules, or whether they intended them to remain the same; but, having had a good deal of practice in building with concrete in various ways, he was always much annoyed with the very foolish provisions laid down for stepping concrete foundations. These might have applied to old-fashioned lime concrete, but they were entirely inapplicable to concrete made either of selenitic lime or Portland cement, which became like a solid block of stone, and in which case, so far as he could see, the footings of brickwork even were quite unnecessary; because, supposing the solid concrete were thick enough, the value of the footings was included in it, and brick footings ceased to be required. The notion that a solid slab of concrete was any stronger if pieces were cut out of the top of it (which was practically what it came to) seemed absurd; and there was a great deal of difficulty in the practical working of concrete that way.

Mr. EDMUND WOODTHORPE, M.A. (*A*), spoke of the desirability of taking the greatest precautions in constructing lifts, after the dreadful accident in New York, in which the fire originated, apparently, from the bottom of the lift, and went right up, spreading all over the building. Fortunately for London—he supposed it was mainly due to the present regulations that in the large buildings there were corridors

of concrete or fire-resisting materials, and in large residential flats the floors were built of fire-resisting materials—they did not have this enormous loss of life, although, in one or two instances, they had had a loss of life in warehouses, which buildings, as they were at present constructed, formed a great source of danger to life. In a great many parts of the City of London were large warehouses for the storage of goods in bulk—often most inflammable goods—and the upper storey, the very top storey generally, was used as a dwelling-place for a large number of attendants. In the Draft Bill they had tried to meet that by getting a fireproof staircase carried right up to the top, cut off entirely from the warehouse itself, so as to have a means of escape, and also to get an exit by that same staircase on to the roof, so that the people could get out. With regard to putting up a party-wall notice outside a building, he should think that that would be very unsatisfactory to the adjoining owner; he might not see it at all, or some one might tear it down an hour after it was put up. He thought that some better way of serving the notice might be found.

Mr. ARTHUR CAWSTON (*A.*) referred to Section XII of the Draft, and to the instance given by Mr. Hall of a building on Streatham Common that might have been built in half timber when there were no buildings against it or near it [p. 109 *ante*]. If permission were ever wanted for such a building to be restored, he would ask whether it would not be desirable to add, "unless other buildings have been built close against "the same." There was the question of the front wall of a warehouse being partly of brickwork. Was there any object in its being half brickwork? Why should it not be all glass window from top to bottom? Cast girders and glass up to 30 feet from the roadway were admissible. Why should it be necessary to have brickwork above as long as it was substantial without? Then Section LIII. (2) of the Draft, as to the separation of buildings and limitation of their areas, ran: "No external wall shall be "used as party wall unless it has been erected or is altered to conform with the pro-"visions of this Act regarding party walls, and the onus of proving that it is so con-"structed shall be upon the *owner* of such wall if he is desirous of its being so used." Should not the onus rest on the person who wanted to use that wall? As regarded lifts going through floors which were fireproof: if they went up a staircase in a building with fireproof floors, were they to be surrounded by walls, or might they go up such a building without walls? It struck him that according to the Draft they could not. Mr. Woodthorpe had mentioned warehouses as sometimes being dangerous. A fire occurred once in Cheapside where the premises of a London glove manufactory had been burnt, and that building burnt like matchwood; attention was then drawn to the fact of the danger of the present custom of match-boarding warehouses from top to bottom. There was generally any amount of gas burning in such buildings, and if there was the slightest spark it was all ablaze, and the match-boarding all around burnt like tinder-wood. If, for instance, the woodwork were obliged to be plastered firmly and bedded in plaster so that the air could not get behind it, it might be safer. There was no material reason why ceilings and walls should not be for the most part plastered instead of boarded. Then Mr. Hall had said that buildings back

to back were very unhealthy; but a building that had two fronts and no back was not always unhealthy. For instance, the corner house of a terrace of private houses which had its door in the side street was, he presumed, a back-to-back house under the terms of the Draft. Would they have such a house forbidden by legislation when two sides, if not three, had plenty of windows?

Mr. BERNARD DICKSEE (*A.*) referred to the question of wooden bay-windows. At the present time anybody desiring wooden bay-windows had to apply to the County Council. That gave the Council a large amount of labour; and it occurred to him that such bays might certainly be allowed on conditions, such as if they did not approach nearer than, say, 10 feet to the adjoining property, or project more than 3 or 4 feet. At the present time the Act allowed the eaves of houses, more than 15 feet distance from other sites, to be of wood; so he thought wooden bays might be permitted under certain conditions. Another thing was that the definition of a building was not quite what it should be—it was a little too all inclusive; it included everything, from a pill-box to a cathedral. A tent could be included as a "building," and he thought the definition should not cover that and things of a like nature.

Mr. H. H. STATHAM (*F.*) said that he hoped they would not hear anything more of back-to-back houses. One speaker said they would be all right if there were ventilation at the side, but that could only be where there were no more than two houses; though when they spoke of back-to-back houses they generally thought of a row of houses, and there was then, of course, no ventilation at the sides. Back-to-back houses should be considered as things altogether of the past; and at all events the Institute of Architects was not the place in which they should be defended. As regarded the question of fire-resisting [p. 131 *ante*] materials, there was a definition which included, first, "concrete of broken brick, of gravel, of broken stone, of coke "breeze," and so on; and secondly "well-burnt brick, terra-cotta, natural or artificial "stone." The word "construction" appeared to include everything except roofs—there was a separate section covering roofs—so that he supposed "construction" included stairs and landings. Now, all fire experts had long ago said that stone stairs and landings were really the most unsafe things in a fire—as being among the firs things that went; and he thought that a little more definition was required in that direction, that the words "for construction" were rather too inclusive, and that that section might be very well reconsidered so as to point out where stone might be safely used and where it might not. The less stone was regarded as a fire-resisting material the better, because they knew it was not; it did not actually burn, but it cracked, and that was just as bad. Nevertheless, a distinction might be drawn between stone when used as a walling material, and stone used as a beam or as a bracket, as in the case of lintels and steps, especially steps tailed into the wall, and with no bearing at the other end: these latter being most treacherous in a fire. Stone forming part of a solid wall might crack with the action of fire, but the wall was not likely to fall immediately from that cause. Stone therefore might be scheduled

as a fire-resisting material for walls, but excluded for other purposes. Then, in the same paragraph [p. 131 *ante*], instead of saying "for bressummers and posts, wood "beams of not less width and depth in any part than 10 inches," they might have said "oak beams." He remembered hearing many years ago from Captain Shaw the statement that there was nothing that so long resisted fire as a good stout oak post: it charred, but it retained its strength for long after. It would not be, in the speaker's opinion the same with commoner and softer woods.

Mr. J. DOUGLASS MATHEWS (*F.*) said, in reference to the preparation of by-laws which had been touched upon, he rather assumed that everybody would agree with Mr. Hall in the view which he put forward. Probably if the by-laws were thoroughly considered by all the parties concerned it might be a very safe process; but if, on the other hand, by-laws were prepared by a certain body which might possibly have various whims or fancies prevailing at the time, it would introduce a system which might be particularly bad and unsatisfactory. It fell to the speaker's lot, before the Act of 1878 was passed, to give evidence before the Select Committee, and on that occasion the matter of the by-laws was fully gone into. It was very strenuously opposed by the counsel representing the Builders' Association and other bodies, and it was suggested at that time that before any by-laws were issued they should be submitted to the Institute and to other bodies, and that every means should be taken to give publicity to the by-laws, in order that they might be very fully considered before they became law. He ventured to think that the public had not had the opportunity of knowing, as they ought to have had, what the by-laws were before they became law; and therefore the less they had to do with by-laws, and the more comprehensive the Act of Parliament was, the better for all concerned. Mr. Hall flattered the district surveyors by proposing to give them a great deal of discretionary power. It was very kind, no doubt, but the district surveyors would like to have as little discretionary power as possible. No doubt they had sometimes to exercise discretionary powers beyond their rights, and as long as the present system was in vogue that might be all very well. But district surveyors might hereafter become officers of the County Council, and a permission to them to use their discretion might cause very serious difficulties. It was not likely that a body of men, fifty or sixty strong, would all take the same view, and therefore if any discretion were given it should be given to the County Council, and as little as possible to the district surveyors.

Mr. BLASHILL (*F.*) said, as to the question of openings, it would be very easy to construct the front of a building of iron and glass; but the object of limiting the openings was to prevent danger from fire. Within 100 feet, a house on fire on one side of a street would readily set fire to anything combustible on the opposite side of the street. The question was, how much opening might be reasonably allowed? Mr. Hall had shown a curious condition of things which might arise in a particular case from the proposed regulations as to space at rear of buildings [see p. 122 *ante* and p. 180]. But his was not a common case, and it could be very fairly dealt with under the proposed regulations. A street was primarily for traffic, and must be

of sufficient width for that object, but it was quite open to any one to say that there ought to be a wider space at the back than at the front of a house. That would not suit the ordinary building owner, and one quite felt that the provision was subject to discussion. Something had been mentioned about a tent being possibly considered a building. It was very desirable that it should be so considered, because people rigged up a tent and put goods of all kinds into it for storage or for sale, or they carried on public exhibitions in it, and, with all the dangers belonging to those various uses, they tried to evade the regulations intended to make buildings safe. The speaker added that he felt personally much indebted to Mr. Hall for the very great pains which he had taken to bring all the difficulties of the subject forward.

Mr. JOHN SLATER, B.A. Lond. (*F.*), said that it was very gratifying to him that so many of the suggestions which he threw out in the Paper he read a couple of years ago had been embodied by the Practice Standing Committee in their admirable Draft Bill. It was refreshing to hear the Act of 1855 praised, as it had been by Mr. Collins, because it had been in use for thirty-six years. But by 1882 it had been found necessary to devise no less than six amendments to it, because it was unworkable as it stood. With regard to what Mr. Statham had just said about fireproof construction, he was quite sure that that definition [p. 131 *ante*], or whatever it was called, would have to be considered very much more carefully. Stone was mentioned without any qualifying clause, and they would find that iron, steel, and other metals were also mentioned without any qualifications. The American Building Acts now laid it down as an absolute rule that no unprotected ironwork could be considered fireproof. It would, he thought, be a very great pity if, in any new Act of Parliament passed at the present time, it should go forth that iron or steel by itself was to be considered as fireproof construction. With regard to lifts, there was one point mentioned which happened to touch him rather nearly. He did not think it necessary to stipulate, if it should be necessary, in consequence of the position of a house with a passenger lift, to have the balance-weights and the pistons, and such things, outside—merely putting a little covering round them to protect them from the weather—that this would constitute a building. It appeared to him, so far as he was able to make out, that if those balance-weights did come outside, and were to be protected, they must be protected either with brick or with some fireproof enclosure, even though there might be no access to the little enclosure from the inside of the house at all. He thought that unnecessary. He did not altogether agree with the regulation inserted in the Draft that individual owners might project on their own property without reference to any authority at all. He for one would personally be very glad indeed if such a clause were in the Building Act, but he thought that adjoining owners ought to be considered; and although there was a certain amount of delay, and perhaps a little difficulty, in getting the permission, on the whole it was right that the authority presiding over the Metropolis, or over the City, ought to have the power of deciding whether or not the projection should be made.. With regard to the point that Mr. Mathews mentioned, as to the discretion of district surveyors, he felt quite sure that that bogey would be

trotted out again, that the district surveyors did not want to have any discretion at all —that they wanted to have everything laid down as a hard and fast rule, and they would see it carried out. But he (the speaker) had more faith in district surveyors. As a matter of fact, now they exercised a certain amount of discretion. One surveyor would not insist upon quite such a stringent interpretation of the law as another; and if the discretion were given to them he did not think they would find much more difficulty in carrying out their buildings than they had at present. District surveyors ought to have authority over sanitation, and if they gave the district surveyors power over other parts of the building it was quite useless for them to have nothing to say to one of the most essential parts of the building—namely, drains. Of course, if more duties were put upon them, they ought to have certain fees; but he did not apprehend that any difficulty would arise from their being entrusted with that discretion.

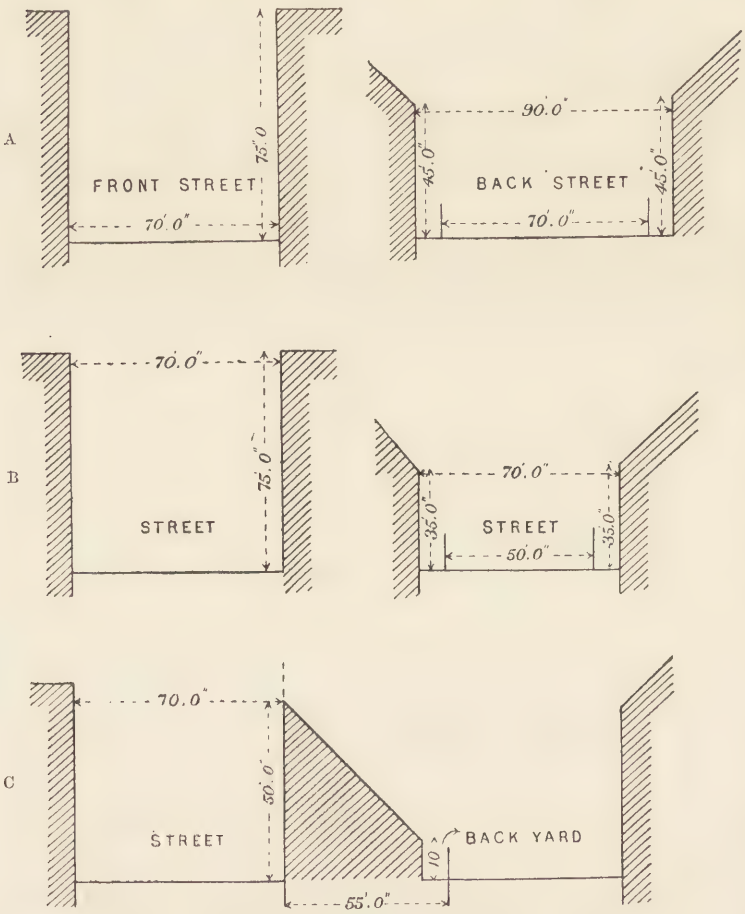
Mr. T. M. RICKMAN, F.S.A. (*A.*), said that the Practice Standing Committee were very anxious indeed to hear the opinions of members on the subject of the propositions that had been put forward after much consideration and labour. There was one point that had been learnt in discussing these matters. All those who attended discussions of the sort gradually got it in their minds that each one of the details fought out on the subject of the Building Acts was one upon which very various opinions were held, and upon which no one could legislate, or draft a Bill, until he had heard both sides of each question—until the matter had been fairly and thoroughly threshed out in committee He was afraid that with the Bill before the public now from the Local Government Board, and with the amendments proposed by the County Council, there was no prospect of that Bill being threshed out in its details before a committee. It was most desirable that there should be some public inquiry, and that a large amount of time should be spent in discussing the various interests concerned,—the interests of the architects, the interests of the builders, and above all the interests of the clients, the "building owners," the interests of the adjoining owners, and the interests of the district surveyors. He trusted that a mere Government Board or the officers of a Government Board sitting by themselves would not have the opportunity of carrying into effect just so many particular suggestions as the members might approve, which were, in fact, likely to be just those which with the information before them they were able to understand. An ordinary draughtsman of a Bill, reading the various suggestions which had come from the County Council, from the Institute, and other bodies, would not be able to deal with them satisfactorily, but there must be some one with a thorough knowledge of building, and of all the interests connected with building, to assist efficiently in preparing the details of the Bill which was eventually to be passed.

The PRESIDENT expressed his want of sympathy with the opinion which had been put forward, that any change in the Building Acts was undesirable, because it would take some years to understand any new Act. That was an argument against any change whatever. His conviction, on the contrary, was that the existing Acts (not Act, because there were several) were so complicated and difficult to understand

that the consolidating and amending them would be a very desirable change, and would so simplify matters as to enable men really to understand the Building Acts, which very few people did now. In regard to Mr. Hall's services, the Council had already voted their thanks to him and to Mr. Rickman, the other Hon. Secretary of the Practice Standing Committee, for the enormous labour which they had devoted to the subject. The amount of time which Mr. Hall especially had given to it was perfectly inconceivable, and he thought that they might fairly congratulate him, after having gone through so complicated a question, on appearing before them so well in health and so vigorous in mind.

Mr. EDWIN T. HALL (*F.*) begged the Meeting to remember that he was only there as the representative of the Practice Standing Committee. He was sure that if their efforts resulted in an improvement of the Building Acts they would be thoroughly repaid. Mr. Nevill thought that it was objectionable that a bay-window should rest upon the ground, though it might be right that an overhanging one should be permitted. He (the speaker) could not imagine that if one admitted that a bay-window might overhang, it could be objectionable that it should grow from the ground; and he would draw attention to the fact that the legislation proposed by the Royal Institute of British Architects was carrying out what was the existing practice in ninety-nine cases out of a hundred. All through London they would see scarcely any bay-windows which did not rise from the ground. If they took the suburbs of London, as a rule there was only a ground-floor bay-window, and the principle which the Committee had adopted was that which was the custom in 99 per cent. of the cases legislated for. As to Mr. Cawston's objection to the observation regarding restoring a half-timbered house if destroyed, it must be remembered that where consent was given to the erection of a half-timbered house, whether at Streatham or anywhere else, there were conditions imposed, and the conditions would have to be observed in the first place and maintained, or else the building could not be allowed to be rebuilt. If the owner contravened the conditions under which the consent was given, he, of course, must forfeit his right to rebuild to the original design. Mr. Cawston also objected, in the case of an external wall being converted to a party wall, to the onus being thrown upon the owner of proving that it complied with the requirements for a party wall. There was no injustice in that. As to the owner, the wall could only be used with his consent. It was said, in effect, that he should not sell that consent to his neighbour unless he proved to the satisfaction of the district surveyor that that wall was constructed as a party wall. With regard to enclosing lifts upon staircases, he thought that was very carefully guarded against. The main object was to secure that lifts should be separated from flats, and that other buildings should be guarded. Mr. Dicksee suggested that wooden bays should be permitted without the consent of the Council. But if there was any one matter which should not be allowed without the Council's consent it was that of a wooden bay in a town house. With regard to Mr. Statham's criticism of stone as a fire-resisting material, the Committee had recognised the difficulty, but they felt bound to include stone as a fire-resisting

material, because it was not desirable, or indeed possible, to exclude it as a material for walls, though for certain purposes, as Mr. Slater had pointed out, it was most objectionable. That was a matter which should be dealt with in the schedule treating of the use of fire-resisting materials. In certain positions stone should certainly be cased, but that did not affect the question of definition. With regard to the question of whether posts should be oak instead of fir, it was no doubt the case that oak was much more fire-resisting than fir; but fir-timber of 10 inches square, the minimum size permitted in the draft, would last a long time. They accepted the principle that nothing was fire-proof, and that any material could only retard the progress of fire. They had carefully said that every by-law to be made under the Act was to be made in accordance with the machinery of the Act of 1878, so that the County Council could not make by-laws without their being first submitted to the Institute and to the Surveyors' Institution, as well as to all other persons interested. If that were done, there was the reasonable publicity that should be given to any change connected with an Act of Parliament. With regard to Mr. Blashill's observation* as to space at the rear of a building, the County Council had published a diagram giving their own interpretation of the matter. If the principle were applied to one side of Cadogan Square, it would have a serious effect on the houses there, although their sites were probably 100 feet or more in depth; it would make their rear walls only 10 feet high, whereas they were now 40 or 50 or 60 feet high. With regard to Mr. Slater's



DIAGRAMS ILLUSTRATING MR. HALL'S ARGUMENT [p. 122 *ante*].

* See p. 176 *ante*.

objection to the necessity of having the iron gearing of lifts enclosed, he regretted to say that he had had experience of the action of the County Council on that point within the last two months, where balance-weights and cylinders were outside the wall. Application was made to them for their consent to enclose the weights and cylinders with wood covered with iron, but the County Council would not listen to the application. As the building was 90 feet high, they had to enclose it with walls 2 ft. 3 in. thick; but they were precluded by covenant from building any brickwork at all on that site, and then the County Council, as a favour, said they might enclose it with ironwork. As to district surveyors having control over drains, he thoroughly agreed with Mr. Slater's observations. The Practice Standing Committee laid it down as a principle that everything within the curtilage of a building should be under the Act, and that the official to have control should be the district surveyor. Mr. Slater said that the district surveyor was the proper person to control the drains; but it did not end there; there were soil pipes and waste pipes, and all those things which go to the top of the building. The district surveyor ought to have the control of everything necessary to complete the building.

COPY OF CORRESPONDENCE.

[*From the Local Government Board to the President of the Institute.*]

20th August 1891.

Sir,—I am directed by the President of the Local Government Board to enclose a draft of a Bill* which has been prepared for the purpose of consolidating the enactments relating to the construction and use of Buildings in London.

The President will be obliged by being furnished not later than the 1st of December next with any observations or suggestions which the Royal Institute of British Architects may desire to offer on the Draft Bill as a Consolidation Bill. He is especially desirous of having his attention drawn to any provisions in the Bill which it may be considered do not accurately reproduce the present law.

I am, Sir, your obedient servant,

(Signed) S. B. Provis, *Assistant Secretary.*

[*From the President of the Institute to the President of the Local Government Board.*]

8th September 1891.

Sir,—I duly received the letter of the 20th ultimo enclosing the draft of a Bill for consolidating the enactments relating to the construction and use of buildings in London,

* This Consolidation Bill was carefully considered by the Practice Standing Committee and the Council of the Institute; and a report thereon was duly forwarded to the Local Government Board.

which have been addressed to me by your order; and I propose at the earliest opportunity to take the opinion thereon of my Council, and offer, as you request, any observations we may have to make on your Draft Bill as a Consolidation Bill.

But before doing so, I venture to submit for your consideration some general observations on the Building Law now in force, as it is a subject which has occupied our attention and that of our Standing Committee for Practice during the last two years. The Draft Bill, with a copy of which you have favoured me, is simply for consolidation; but amendment is the real necessity. In March 1890 the Council of this Institute, when addressing the County Council in the matter of the London Council (General Powers) Bill—then before the House of Commons—urged upon them the speedy introduction of a new Bill for amending as well as consolidating the laws relating to buildings within the administrative county of London. Since then, we, assisted by the practical knowledge of experts, have prepared with great labour and pains the materials for a complete Amendment Bill, dealing exhaustively with all those questions which the experience of the last thirty-six years—during which the Metropolitan Building Act, 1855, has been in force—has shown to require amendment. In fact, to make legislation on this important subject useful and effective, the introduction of an Amendment Bill simultaneously with a Consolidation Bill is imperative, at least if the requirements of the present day are to be satisfactorily met; and I hope to be enabled, in due course, to submit to you the materials to which I have referred, for a thorough amendment of the London Building Law.

In the meantime, I beg leave to enclose with this a statement of some few essential amendments of the Metropolitan Building Act which are urgently required.

I am, Sir, your obedient servant,

(Signed) J. Macvicar Anderson, *President.*

[*Enclosure.*]

General Suggestions for some few essential Amendments of the Metropolitan Building Act, 1855.

1. The definitions throughout require amplification and revision.

2. The Act should include all matters relating to the sanitation of a building. The Act should extend to everything within and forming the enclosure of the curtilage of a building.

3. All details of construction should be placed in schedules; and the London Council and the Commissioners of Sewers, City of London, should in their respective jurisdictions (if the latter is maintained) have power to vary them by by-laws to allow of the adoption of new materials, new inventions, and new modes of construction, without the necessity of application to Parliament.

4. Certain erections, not actually buildings, such as glass roofs over yards, private bridges over streets or between blocks of buildings, telephone and telegraph posts on

buildings, &c., &c., wall-signs and advertising boards, should be subject to control; and, as regards the latter two, in certain cases to absolute prohibition.

5. The construction of light and lift wells, both inside and outside buildings.

6. The experience of successful evasions of the existing Act to be brought to bear in correcting such mischiefs.

7. Many provisions with reference to the exemption of buildings, the enlargement of buildings so exempted, continuance or withdrawal of exemption when circumstances changed, require revision.

8. Exemption of buildings of dock and railway companies to be limited. The control of the accesses to and within public buildings, and their arrangement and construction, to be subject to control of superintending architect; the special control of buildings intended for one purpose and converted to other uses requiring particular precautions.

9. The rules as to recesses and openings in external walls most urgently require revision to meet the necessities of trade.

10. The rules as to projections of shop fronts, which it is now decided authorise encroachment on the public way, should be revised.

11. The excessive height of 90 feet authorised by the London General Powers Act, 1890, should be materially reduced.

12. The height and number of storeys in roofs require restriction, and a provision that such roofs should be rendered fire-resisting by pugging or otherwise is desirable.

17. The Tribunal of Arbitration should be properly named the "Tribunal of "Appeal"; its powers should be extended, and provision should be made for the adequate remuneration of its professional members.

18. The results of thirty-six years' experience of the working of the present Act should be codified and incorporated in the new Act.

[*From the Secretaries of the Institute to the Local Government Board.*]

21st December 1891.

Sir,—Referring to the Suggestions for a Draft Bill for the Codification and Amendment of the Metropolitan Building Acts * which were forwarded to you on the 2nd instant by order of the Council of the Royal Institute of British Architects, we are instructed to invite your attention to the following suggestion, which, with others, was submitted by the Council of the Institute to the London County Council on the 3rd March 1890, respecting the draft of their General Powers Bill then under consideration:

"It is suggested that in cases where the height is, or exceeds, 80 feet, measured

* See p. 176, *ante*.

"from the level of the footway in the centre of the façade to the level of the top of the "topmost storey, the construction of the building and the satisfactory arrangement "for escape from fire should be specially approved by the district surveyor before the "works are commenced, with an appeal from his decision as provided in the Bill. "In considering the construction, regard should be paid by the district surveyor and "the Appellate Tribunal to fire-resistance, and to ready egress in the event of a fire; "and the certificate of approval should specify a limit to the number of storeys in any "roof."

We are to express a hope that, in the drafting of any such amended Bill as is suggested, the expediency of making the use of fire-resisting materials compulsory in the construction of important or extensive metropolitan buildings will not be lost sight of, but that at the proper time a subject of such vast importance to so densely populated a city as London will receive at the hands of the Local Government Board the consideration it deserves.

We have the honour to be, Sir, your obedient servants,

(Signed) Aston Webb, *Hon. Secretary.*
William H. White, *Secretary.*

[*From the Local Government Board to the Secretaries of the Institute.*]

31st December 1891.

Gentlemen,—I am directed by the Local Government Board to acknowledge the receipt of your letter of the 21st instant, and to state that the suggestion of the Council of the Royal Institute of British Architects with respect to the Regulation of the construction of buildings so as to provide means of escape from fire, &c., will receive the consideration of the Board in connection with the London Building Law (Consolidation) Bill.

I am, Gentlemen, your obedient servant,

(Signed) C. N. Dalton, *Assistant Secretary.*

XCIII.

STAINED GLASS. By R. HERBERT CARPENTER, F.S.A., *Member of Council*; Mr. JAMES C. POWELL; Mr. N. H. J. WESTLAKE, F.S.A.; and Mr. CLEMENT HEATON.

Mr. J. Macvicar Anderson, *President*, in the Chair.

INTRODUCTION.

MR. PRESIDENT AND GENTLEMEN,—

IT is, perhaps, not necessary for us this evening to determine exactly how far a mode of decoration so valuable for its artistic effect as painted glass is should be under the control of an architect, though we may fairly assume that if, as an artist, he is fitted to have an important work entrusted to him, he should be able to direct those working with him, without arbitrary or vexatious interference with them, so that the painted glass, both in style and treatment, should harmonise with, and give life and interest to, the architecture of the building, and to any decorative treatment superadded to it.

Happily, it seems now to be more and more impressing itself on the lay and clerical mind, that when the architect and the artist in glass painting act and re-act with and on each other, the result is more likely to be successful than if each were to work independently of the other; and if I single out one instance of such a result —namely, Truro Cathedral—I do so because we had hoped to induce our friend Mr. Pearson to help us this evening by some words of counsel, telling us how he and Mr. John Clayton combined to produce so very beautiful and harmonious an internal effect. We have, however, the advantage of studying some of the admirable drawings in colour lent by Messrs. Clayton and Bell for publication with these Papers. Illustrations of glass at All Souls', Oxford, representing the four Doctors of the Latin Church, associated with the emblems of the Evangelists—association of a remarkable character—are given in black and white to the same scale as that of the original drawings [figs. 30, 31, 32, 33].

The history of glass painting is far too large a subject to do more this evening than

Fig. 30.—All Souls' College, Oxford: St. Augustine, with the Eagle of St. John.
(From a coloured drawing by Messrs. Clayton and Bell.)
Scale of about three inches to one foot.

Fig. 31.—All Souls' College, Oxford: St. Gregory, with the Bull of St. Luke.
(From a coloured drawing by Messrs. Clayton and Bell.)
Scale of about three inches to one foot.

FIG. 32.—ALL SOULS' COLLEGE, OXFORD: St. Ambrose, with the Angel of St. Matthew.
(From a coloured drawing by Messrs. Clayton and Bell.)
Scale of about three inches to one foot.

Fig. 33.—All Souls' College, Oxford: St. Jerome, with the Lion of St. Mark.

(From a coloured drawing by Messrs. Clayton and Bell.)
Scale of about three inches to one foot.

glance at it; but we shall, I think, see even thus how intimate must have been the relationship between this art and architecture, and that in all the various changes of style through successive centuries, each art depended upon the other for the realisation of the intended effect of the architect's design. For instance, in the early days of the Christian era the small window-openings filled with gem-like glass must have afforded a most striking and brilliant contrast to the large wall-spaces harmonised with them by means of their mosaic and gold surfaces. Both arts originating in the intense sunlight of the East, combined, therefore, in their one object—which we may see magnificently fulfilled in the "Dome of the Rock" at Jerusalem—of subduing the power of the sun, and of producing that sober but exceeding richness of effect which must have formerly existed (and still does to some extent) at St. Mark's, Venice, and at Ravenna, and in that most glorious building, the Church of "The Divine Wisdom" at Constantinople.

But, as architecture travelled westwards and northwards into less sun-favoured climates, and as windows in the eleventh and twelfth centuries perforce grew larger, yet the so-called "mosaic glass," with its Byzantine ornamentation, was retained in use, while there was added the interest of pictorial subjects in medallions; though these were at first kept quite subordinate to the gorgeous and jewel-like effect of colour, emphasised and intensified both by brilliant lines and sparkling points of white glass, as well as by bold black geometrical forms of iron framework and leading, just as the Eastern glass invariably is emphasised by its thick bevelled plaster settings. Thus we feel, when we view the wonderful windows of this early date, both in France and England, that as they are so much a part of one artistic whole, and as such to be enjoyed, we take little thought for the study or examination of their pictorial details.

In the thirteenth century there prevailed not only the use of similar vivid, intense, and gemlike glass, but also that of silvery and brilliant pattern glass of white, with a bluish-green tinge in it (the latter being used notably by the Cistercians), combined with rich bands of pictorial figure-subjects on a white ground, or single figures, retaining still some of the old Byzantine mannerisms.

When, however, in the course of the great changes brought about in the architecture of the "Transition" and of the fourteenth century, the wall-spaces shrank to piers, the great mullioned windows required a grand and broad treatment of glass; and though the "mosaic glass," as such, went out of use, yet its extremely rich colours were retained, though lighter in tone, while a lemon yellow stain, in combination with white, was introduced.

At this period there was infinite variety in the design and treatment of glass, taking as examples the great west and east windows and the aisle windows of York Minster, all of them being almost unrivalled in England. The aisle windows differ widely from each other in their arrangements, and still more in their treatment and colour, from the other two great windows, yet one and all are equally charming. The window tracery of this date is carefully designed so as not only to be beautiful in itself, but also that it may subdivide and frame the translucent pictures; as, however, years

went on, the masonry became more studied in design than the glass openings, to which the glass had to adapt itself. Yet in England we never descended to the vagaries of the French and German "flamboyant style." Then, as the large windows became multiplied, the great area of glass required, both as a rest for the eye and to display the design of the traceries, a large proportion of white and greenish-white pattern or quarry glass, as in the case of Exeter Cathedral, where the most stringent rules as to this proportion were laid down (an example which it would be desirable for us in many cases to follow). And here I may refer to a note by Professor Lewis, concerning the glass of the Duomo and of Santa Maria Novella, at Florence. He writes that it "has "a very peculiarly brilliant effect, reminding one of those mosaics in which *white* is "introduced at the 'Dome of the Rock' at Bethlehem and at Torcello," &c. At Florence, he believes, this effect is produced "by painting the *outside* of the white glass with a "light brown tint, not opaque enough to prevent the passage of light, but so as to cause "it to *reflect* the light sent from the opposite windows."

By very gradual changes there thus grew up perhaps the most characteristic English glass, namely, that of the fifteenth and early part of the sixteenth centuries. It had slowly separated itself from the gorgeously tinted Eastern glass, acquiring greater breadth, and infinite delicacy of both drawing and tone, and had combined with the older styles and their variations some essentially new methods, the most important of which was the use of *enamel*, or painting on white glass with enamel colours and stains.

At this time the simultaneous changes in the architecture seem to show that one mind and one idea influenced the designers of both buildings and glass; and to so great an extent, that when we now see those glorious churches of East Anglia, triumphs of masonic skill, and, taking the facilities of the age into consideration, surpassing in science and in beauty the so-called "engineering triumphs" of this day—now, alas! bereft of their ancient glass, we cannot but feel that their very life and soul have departed, leaving but dead skeletons, so absolutely in them does the one art depend on the other for its vitality.

Feeling this, what can we say to such words of recent criticism as those of Professor Moore's: "In stained glass there were no peculiar styles either in England, "Germany, Italy, or Spain"; and "nowhere save in France was there in this art [glass "painting] an active spirit of original invention, nor was there anything in the cha- "racter of the architecture to stimulate its production?" * Is this, I will ask, to be considered a fair description of England at the beginning of the sixteenth century? Can it fairly be applied to the works of the other three communities named, such as Cologne, Bologna, or Barcelona can show?

Indeed, it seems to be an important question for us to consider—if the English glass of this period is that which should be adopted as the best type for modern work—whether we should not be right and logical in also going back to and developing that

* *Development and Character of Gothic Architecture*, 8o. London and New York p. 309. See the review by Mr. A. E. Street, M.A., of this book in *The R.I.B.A. Journal*, vol. vi. p. 277.

same grand period of architecture so characteristic of England, and which in its day had no equal in Europe.

It was at this period that the difficult subject of the proper treatment of "Memorial windows" was most ably dealt with, a subject which concerns us in these days also. Unfortunately, in the last half-century or more, so much and perhaps irreparable harm has been done to our churches, both great and small, by the insertion of too many well-intentioned but often utterly incongruous and crude original designs or ghastly imitations of mediæval work, that we are apt to judge the *principle* of memorial windows too hardly. Mr. H. W. Brewer, for instance, in his delightful account read to us here of the churches at and near Cleves, wrote, "That unfortunate invention the "memorial window"; and he doubts that mural tablets "ever injured the effect of a "building as do these memorial windows," and he is of opinion that memorial windows "form most inappropriate memorials of the dead." * But if we were *now* able to compare with some of our modern work such a series of windows as those described as existing in 1685 in the noble church of Long Melford,† and those recorded as having been erected in the great church of the London Greyfriars,‡ we should be better able to appreciate the difference between the use and the abuse of this principle.

In Long Melford church the lofty windows of the aisles, thirty-eight in number, were all filled with memorial glass, with dedicatory inscriptions and coats of arms, while in many also there were represented the kneeling or standing figures of the benefactors commemorated by them, kept, however, in proper subordination to the sacred figures or subjects above. In the church of the Greyfriars all the thirty-six windows, excepting one put in "by small alms," had dedicatory inscriptions to the memory of their respective donors, amongst whom were included Edward III. and his mother Queen Isabella.

To my mind, notwithstanding some objections and some difficulties, the "memorial "window" as a *principle* is of inestimable value, not only for its artistic and historical interest, present and future, but because it links us with "those whose rest is won."

As to the question of "symbolism" in painted glass, I would urge that it be taken very carefully into consideration. It should not, I think, be treated so as to be too patent, nor force itself upon attention, but it should be there, to be sought for by patient investigation. Symbolism certainly need not be developed to the extent set forth by Durandus. We may, however, perhaps accept its definition by a modern writer (Mr. J. Romilly Allen, F.S.A. Scot.) thus: "Symbolism may be defined as a "means of conveying ideas and facts to the mind by representations, which are, in the "first instance, merely pictorial, but by frequent repetition gradually assume certain "stereotyped forms. It is, in fact, a conventional system whereby pictures of his-"torical scenes or natural objects are made use of to express something beyond what

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* Transactions, Vol. VII. N.S., "Churches in the Neighbourhood of Cleves," p. 304.

† See "The Church of the Holy Trinity, Melford, Suffolk," in the second volume of *Views of Collegiat and Parochial Churches in Great Britain*, by J. P. Neale and J. Le Keux, 8o. Lond. 1824–5.

‡ Dugdale's *Monasticon Anglicanum*, fo. Lond. 1849, vol. vi. pt. 3, p. 1520.

"appears to the eye; and set in motion a train of thought, leading the mind on to "contemplate those abstract ideas that are associated directly, or otherwise, with the "thing portrayed." *

When one comes to consider the many questions and difficulties associated with modern painted glass, it seems to me perhaps best, in order to save time, to put one's thoughts and experience into the form of the following "postulates":—

1. That the glass be brilliant, translucent, and jewel-like in its decorative effect, whatever its treatment be.

2. That while recognising the beauty of enamels, the colours be to a great extent of "pot metal" of unequal tone and thickness, notwithstanding any difficulties there may be in the leadwork.

3. That in each particular building its due proportion of white glass be fixed beforehand, and adhered to throughout.

4. That the design of the necessary ironwork inserted by the architect be carefully considered in designing the glass, with a view to the brilliancy given by contrast, and that under no circumstances should any sound *ancient* ironwork be taken out of a window.

5. That the leading be an essential part of the completed design, and be shown on the sketch drawings submitted by the glass painters.

6. That each window should form one of a complete scheme, to be previously determined by the architect with the authorities of a church, and rigidly adhered to by donors; and that all the windows should be designed by the same hand.

7. That the representation of sacred subjects should neither be too pictorial nor too realistic, nor, above all, sentimental, but should be illustrative of religious principles applicable to all time—treated in an architecturesque and conventional manner suited to the material.

8. That a carefully thought-out system of symbolism be adopted.

9. That pictorial subjects extending over more than one light should only be selected where they lend themselves to arrangement in divisions, each division being to a great extent complete in itself; thus the masonry would not appear intrusive, nor as if it were *in front* of an expanse of glass.

10. That the series, either of figures or of subjects, be selected in proper doctrinal and historical gradation from west to east of the church.

11. That in memorial windows the kneeling figure might often be introduced in the "predella," with a legible inscription on the glass instead of, or in addition to, the usual brass plate.

12. That heraldry, whether in sacred or secular buildings, should be an essential part of the design.

13. That in the case of ancient churches, where the windows vary in date, the glass should be to a great extent assimilated in each case to the several dates of the masonry, while preserving a general harmonious effect.

R. Herbert Carpenter.

* *Christian Symbolism in Great Britain and Ireland*, 8o. Lond. 1887, p. 1.

DETAILS AND TECHNICALITIES OF THE GLASS-PAINTER'S ART.

MR. PRESIDENT AND GENTLEMEN,—

I WILL not take up your time this evening by entering into any history of the art of glass-painting, but will endeavour as far as possible to carry out my instructions—namely, to describe the process of making a painted window; to say something about the different materials used; and to add certain ideas that have occurred to me during my study of this ancient decorative process.

After taking the dimensions of a window, ascertaining its aspect and surroundings, and its height from the floor,—and, if a personal visit is not possible, obtaining a photograph of the interior of a building—a small coloured sketch is prepared of the design, usually to a scale of one inch to the foot, or whatever scale the artist is most used to. On this drawing is, or should be, shown the plan of the ironwork which is to support the window when fixed; this should be arranged to assist the design, and not to interfere with the important parts of the figures. The sketch should show distinctly the scheme of colour throughout, and the composition of the figure and ornament, but not necessarily the details.

When the sketch has been approved, full-size cartoons are prepared, and then is the time to make such studies from the life as are required. Next to the heads, the hands and feet want special study, as they are so conspicuous when painted on white glass and surrounded with colour. I often think that for hands one cannot do better than study Botticelli in his work; the spaces between the fingers give just the amount of black that is so useful in glass. On these cartoons, which should be real working drawings, the ironwork and the arrangement of the lead lines should be definitely shown; and it seems to me that as much pains should be bestowed on the designing of the lead as on the folds of the drapery, the leads being more conspicuous. A drawing on which the lead lines are all shown will translate much better than one, perhaps more beautiful as a drawing, in which the leads are shirked, and have to be arranged afterwards by another hand. White objects surrounded by dark colour should be drawn smaller than when against a white background, as the light passing through the white object has a tendency to widen it; this is obviously the case with regard to the extended arms of the figure on the cross when on a coloured ground. From the finished cartoon a tracing is made of all the lead lines on calico or some such material, and this is called the *cut-line*; this may be numbered to correspond with the number of the different coloured glasses. It is then given to the cutter to cut the glass to the corresponding shapes on the cut-line. In this he should be assisted by the artist, so as to select from the sheet the most suitable pieces. A good sheet of glass varies very

much in shade from its different thickness, and it requires considerable discrimination to take advantage of it, and to make the glass coincide with the light and shade of the figure.

When all is cut, the glass is taken to the painting-room, and laid out on its cut-line, and the painter, laying each piece of glass on the cartoon, traces from it in the enamel pigment all the leading lines of the drawing—tracing them strongly or delicately according to the scheme of colour, delicately if a white window, strongly if a deep-coloured window. At the same time he adds the ornamental patterns that embroider the draperies or diaper the backgrounds—those on the white glass being the most elaborate, those on the red and yellow the strongest. These two last colours seem to eat up more black than others, and to require more patterning.

The glass is then fired in the kiln, and brought back to the painting-room to be fixed with wax to a framed piece of plate-glass, so that it can be placed on an easel and seen against the light for the convenience of painting.

The paint, used as water-colour, is then applied to the glass with large flat brushes, and worked smooth or rough according to the requirements of the design—the smooth mat for work that requires great finish and for drapery of small folds, the rough or open stipple for larger and stronger work. The high lights are then removed with scrubs, and the half tones got by reducing the density of the pigment. On this another mat of colour is worked, and the process repeated so as to deepen the shadows; sharp high lights can be taken out of the pigment by means of a pointed piece of wood or a quill, and are very effective if used with judgment and sparingly; they are often too frequently used, I think, by modern glass-painters. Another difficulty is to get the painter to realise the height the window is to be from the eye; he too frequently works to obtain a good effect on the easel.

The glass is then removed from the easel and again fired, and this has the effect of lightening the shadows. It is again fixed on the easel, and the above process is repeated till the required strength is obtained. Great care should be taken to keep the shadows luminous; if they once become opaque the glass looks heavy and dirty and loses brilliancy. If greater strength is required, it is well to enforce the tracing lines, or to hatch lines over the shadows; the last was much done in the sixteenth-century glass.

When the painting is finished, the silver stain is added, where required, to such parts as hair, the embroideries of the white draperies, or foliage, when painted on the blue glass, and to the ornament portions of the window. Great effects can be got by the use of the silver stain, as colours varying from the palest lemon to orange red can be obtained on the white glass. It can be used also on several of the lighter coloured glasses. Mr. Burne Jones, I believe, uses no pot-metal yellow, but gets all his yellow from the silver stain.

The burning of the silver stain requires a good deal of attention, as the different glasses take the stain at different degrees of heat, some white glasses requiring very little, others a good deal of heat; blues, generally very little.

Our window is now finished painting, but should be again fixed up on the easel plate to see the quality of the silver stain with the other colours.

The glass is next laid out on its cut-line on the glazier's bench, and the leading process is carried through, which I need not describe, as it must be so well known to you all. For my part I prefer a flat lead of a quarter inch in width for small work, or three-eighths for large; the glaziers prefer the round lead, as it makes a neater piece of work, but I think it is not so strong and is not so suitable for the after process of cementing. After the leading is soldered on both sides, the leads are raised and an oil cement is rubbed well in on both sides; the leads are flattened down again, and the waste cement cleaned off. The copper ties which are to tie the glass to the iron bars are then soldered on, and after the lights have stood for a few days for the cement to harden, all is ready for fixing.

Now, to say a few words as to the materials used in the production of a window. First, of course, the glass. In doing so I feel we ought to acknowledge the great debt we owe to that painstaking barrister, Charles Winston, who, in 1850, at his own cost and from pure love of the art, caused the old glasses to be analysed and new glass made from the results obtained. Coloured glass is obtained by melting certain metallic oxides with the raw material or base, as it is called; * these are placed in the pot or crucible in the furnace, and when sufficiently melted the glass is gathered on a hollow iron rod by the glass-blower and formed into a cylinder or "muff," as it is called. These are then passed through the annealing ovens and cooled gradually. The muffs have then to go through a second process called spreading, which is to flatten them into a sheet; the muff is first cut through with a diamond, is then reheated and flattened into a sheet, and again annealed. A good workman, in blowing the muff in the first instance, can so handle the glass as to produce varied thickness, which, of course, gives varied tints of the same colour in one sheet. The pot of glass will also give considerable variety of colour in the different workings.

Glass more even in substance seems best suited to work requiring delicate finish, such as one finds in that of the fifteenth and sixteenth centuries. But glass streaky and glittering from its bubbles and *striæ* is best for windows designed in a strong key of colour, when the painting should be simple and strong. Streaky glass is always useful in backgrounds and nimbi.

In making some experiments the other day we hit upon the traditional charcoal yellow, and found that in colour it is almost identical with the straw yellow of the thirteenth century. To produce it a different base was necessary, and this has given to the glass that horny quality which is so beautiful in the early material. We are now building a new furnace, which will enable us to continue these experiments and produce other colours of a similar quality. Glasses made in the manner above

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* The principal oxides used are:—Copper, which in different ways produces ruby, green blue, green. Gold—pink ruby. Iron—yellow and green, also a pale blue. Tin—white. Nickel—violet. Manganese—red purple. Chromic oxide—yellow, tending to emerald green, cobalt.— J. C. P.

described are known as pot-metal colours, and in them the colouring matter goes through the entire substance of the glass.

We now come to the glasses known as flashed or cased glasses: this applies chiefly to ruby glass, the colouring matter of which is of so dense a nature that it is blown as a film only on a base of white glass. The glass-blower gathers the necessary quantity of ruby from one crucible, and dips it once or twice into that containing the white glass. It is then fashioned as before into a cylinder, or it is trundled out into a circle; in the latter form a greater variety of thickness is produced and a consequent variety of colour. In the circle form, it does not require the second process of spreading, which is sometimes injurious to ruby glass. If, instead of a white base, the *ruby* is cased with a blue, yellow, or other tinted glass, a great variety of beautiful shades can be produced.

Besides the ruby glass, a cased blue from cobalt can be obtained, which is very useful. This process only applies to those oxides which are of sufficient density to give a rich colour in a thin layer. One great use of these cased glasses is that you can remove parts of the coloured film and expose the base colour underneath; which is done by coating those parts the colour of which you wish to retain with Brunswick black, and removing with hydric fluoride the parts exposed. This is very useful for heraldry, where the charges are often too small to lead, or for the patterning of robes. Those who have studied the old glass at Cologne, Nuremberg, and elsewhere, know what gorgeous effects can be produced by this method. In Cologne Cathedral is a small panel of rabbits feeding in a garden: the rabbits are leaded in white glass matted with the brown pigment; the garden is produced with cased blue glass; some of the flowers are got by leaving the blue glass exposed, others by *aciding* away the blue and leaving them white; the rest of the blue is stained over with the silver stain, and produces a beautiful green foliage.

The pigment used by the glass-painter for tracing and shading is a fusible glass containing a sufficient quantity of an infusible powder to produce the effect of opacity. The opaque substances most commonly used are ferric oxide, cobaltic oxide, and manganic oxide. The glass fixative must be more fusible than the glass background, but at the same time must be perfectly durable. The pigment must be ground to the finest powder, and reground with a medium of either water or tar-oil. The window may be painted entirely in water-colour as described, or it may be traced in oil-colour and matted in water-colour; and when the lights have been removed with the scrub, oiled all over and the shadows strengthened with smear shading. This process saves some of the firings, but in my opinion is not so good as the more costly process of constant firings, because the shadows have a tendency to become opaque and to give generally an unpleasant texture.

The other pigment is the *silver stain*, the oxide of silver; this is mixed with an infusible medium such as kaolin or ferric oxide, moistened with water or tar-oil. By some the soluble nitrate is preferred, on account of the facility with which it can be mixed and its strength regulated.

The next material is lead, which is first cast in short lengths and then elongated by mechanical pressure. The vice used for the purpose consists mainly of two slightly indented wheels, revolving one above the other, between which the lead is gradually drawn inwards, elongated, and crushed into shape. There are various widths of lead both in heart and cheek now in common use, some with flat and some with rounded surface, and varying in width from one-eighth to five-eighths of an inch.

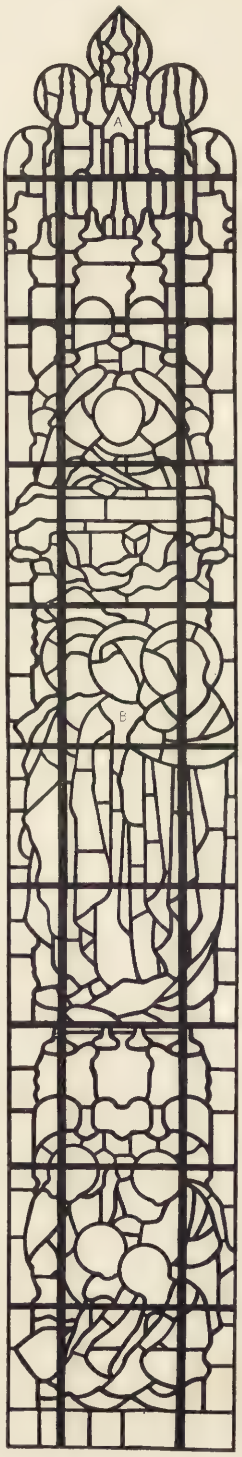

Fig. 34.—One Light of a Modern Five-light Window at Tortworth Church, Gloucestershire

Showing the whole of the lead and iron. [See figs. 35, 36.]

I have always understood that the lead used in the old windows was cast in its full length, and it is generally narrow. Much of the old glazing has been releaded at different times, when a wider lead was frequently used; and, if you examine it, you will find the painting hidden all round the edges, noses and points of foliage being cut off, showing that it was originally in a narrower lead. It is an interesting question whether the use of narrow lead necessitated the use of the diagonal line in design, but it is curious to note that you very rarely find patterns of a square form in the thirteenth or the fourteenth centuries. Almost all the grisaille patterns of those periods were designed on diagonal lines, and the quarry patterns were invariably of the diamond form. These lines give a perfect drain for the water, whereas the water would be likely to find its way through the horizontal lines of square glazing in narrow leads. I have heard of modern square glazing in narrow leads perishing very quickly; this may be due to bad workmanship, and to its not being properly supported by iron bars, but still it is worth a thought.

As stated, I should advise the use of a lead a quarter or three-eighths of an inch in thickness. The wider the leaf of the lead, the more it is likely to resist the weather. For a window designed in a strong key of colour use as much leadwork as possible; it enhances the coloured glass enormously, and adds to the brilliancy and glitter that are so beautiful in the Cathedral of Chartres and the Duomo of Florence. In the whiter painted windows you do not require so much lead, but I think it better even then to err on the side of too much rather than too little lead. It adds a mystery to the design which is pleasant. I would also advocate the use of one-width lead throughout a window; it keeps the treatment flat and decorative.

Fig. 35.—The Central Subject (b) of the Light [see fig. 34].
Recently fixed at Tortworth Church, Gloucestershire.

I show a drawing [fig. 34] of a complete light, giving the leads and bars of a window at their full width, with details of portions [figs. 35, 36], which may possibly be instructive.

To the ironwork which holds the window in its place the artist should pay special attention, because if used at too great intervals the glass will soon begin to bulge from its own weight, and the weather find its way through the weakened leads and cause serious damage. Saddle-bars should not be more than 12 inches apart. In the subject-windows of the thirteenth century the ironwork formed a geometrical grille over the whole window, in the shape of quatrefoils, circles, &c. This iron is of considerable thickness. In that used in the grisaille windows at Salisbury the outside iron saddle-bars are $\frac{3}{8}$-inch face by $\frac{3}{4}$-inch, and the inside central stanchion and every third saddle bar $1\frac{1}{4}$-inch face by $\frac{5}{8}$-inch.

In the windows of later periods we get one or two upright stanchions framed to saddle-bars. In very narrow windows the saddle-bar is sufficient: one wide and two narrow look well. The most useful method in wider windows is to have a double stanchion with saddle-bars at distances varying from 10 to 12 inches, according to the width of the light.

I have found the following look well: stanchions 1-inch face by $\frac{5}{8}$-inch; and saddles $\frac{1}{2}$-inch face by $\frac{5}{8}$-inch. All ironwork should, I think, be on the inside, and as close to the glass as possible, so as to get the full strength of the black which is so valuable a foil to the coloured glass. If the architect wishes for outside iron as well, the glass-painter need not grumble, for it enhances his work. It also, I think, breaks up the outside surface of large lights, and scales it better with the surrounding architecture.

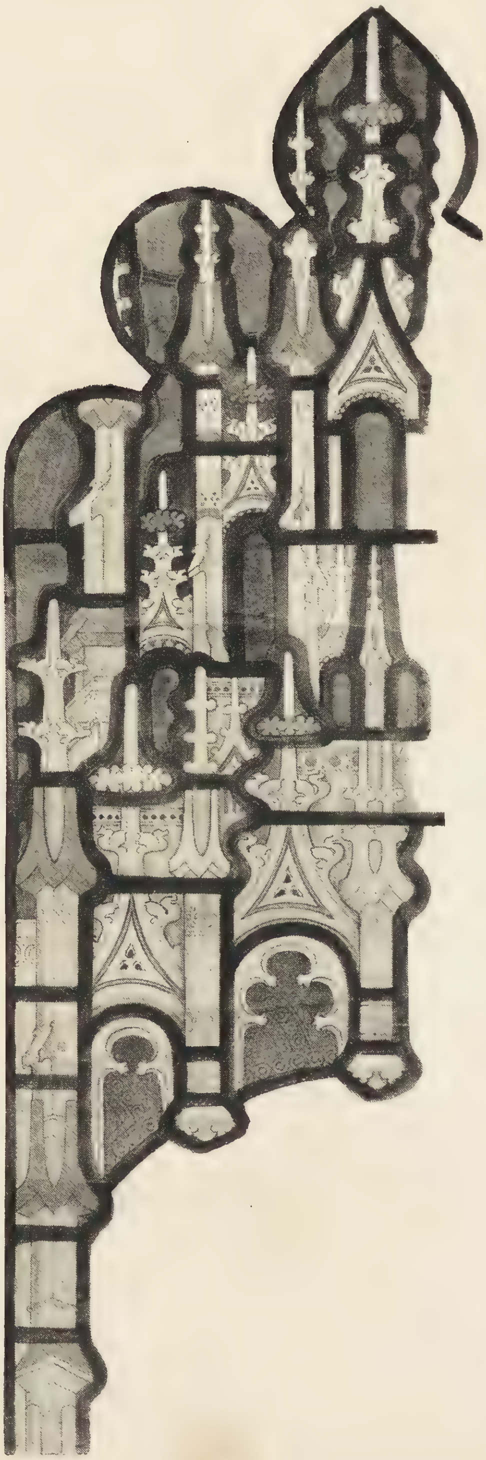

Fig. 36.—Canopy Subject (a) of the Light [see fig. 34].
Recently fixed at Tortworth Church, Gloucestershire.

Wire guards are an abomination to the glass-painter and a detriment to the architecture; a lead across a broken pane is preferable, I think, to the constant eye-sore of a wire guard. It is difficult, however, to get the donor to appreciate this. Sheets of plate-glass placed outside to protect stained glass look worse.

With a few general remarks, gathered from one's experience and mistakes, I will close what I have to say.

1. First of all we should remember that a window is made to admit light, and we glass-painters are constantly sinning in shutting out too much of it. This is one of the points that the architect should advise on, as he best knows how much light will suit his building. I remember reading of an old contract made, I believe, in the fourteenth century, between some cathedral body and a glazier, in which he was to provide glazing composed of two-thirds white glass to one-third of coloured. It need not be necessary to go so far as that, but still I think white glass should bear a large proportion. An east window requires more colour, perhaps, than side windows, because the glare of a light window in your eye prevents your seeing the reredos or any other decorative work surrounding it.

2. There is a tendency now, when so many colours are made, to use too many different glasses in one window. If you will study the splendid effects obtained in the windows of the thirteenth and three succeeding centuries, whether at Canterbury, Chartres, York, Wells, Nuremberg, or Florence, you will very rarely find more than eight glasses used, and often less. The best decorative effects are produced with a simple scheme of colour, just as in mosaic and other decorative processes. I have seen a good effect produced in a large window with three glasses, white and blue that would stain well, and ruby.

3. We often want more harmony between the glass and its frame, which is never wanting in old work of the best periods, where the ornament-details of the glass are the same as those in the architecture, leading one to suppose that the architect must have had, at least, considerable supervision of the glass. We could not put the same design into a window of the fifteenth century as we should into a window of Wren's architecture; therefore I think the design of the glass must bear some relation to that of the stone. In each the figure must be equally well drawn, but the ornament may partake of the characteristics of the style of the stone, without slavishly copying the details of the old work. In fourteenth-century grisaille the artist went to nature for his details, and we may do the same and study the growth of the vine, the oak, and other plants as he did, but they must be drawn in a manner suitable to the materials of glass and lead.

4. There is a tendency to crowd our windows with too many figures. I think we should get a better decorative effect by using more ornament and fewer figures, giving greater repose to the building and uniting the windows more with the wall-spaces. Simple effects are often the best; single figures on quarry grounds, bands of subjects with grisaille between, or a well-designed silvery canopy with single figures, look well, I think.

5. Another point requiring careful study is the scale of the figure used; we sometimes see figures that entirely dwarf a parish church and even make a cathedral look small. This is more particularly the case when the figure is realistic in drawing, and detaches itself from its ground by strong contrasts of colour. The eye catches the figure and scales everything by it. This may be obviated somewhat by working the colour of the ground into the figure. This again is a point in which the architect should assist the designer. If it is necessary to take a subject through two or three lights—examples of which may be seen in the choir of Bristol Cathedral (where a Sebastian in a central light is being pierced by arrows shot from the side lights), and in the Jesse window of Wells Cathedral—design each group as a separate composition, but avoid running arms and legs behind the mullions.

6. Avoid large composition of figures and canopies running across several lights, as in the windows of the Chapel of the Sacrament at Brussels—windows which would be splendid in St. Paul's Cathedral where there are no mullions, but out of place where a flat treatment is necessary. I cannot help telling you the effect of these windows on a friend of mine who was going with me to see them for the first time. On our entering the church from the opposite side he turned to me and said: "What "a splendid opportunity for you; there is a scaffold to every window, and we can "get up and examine them closely!" Another moment and he saw what he had taken to be scaffold-poles were the mullions. This explains better than anything I can say the mistaken principles of such work.

7. Lastly, let us advocate the preparation of a scheme for the subject of the windows of a church; it would help to prevent the higgledy-piggledy arrangement now so common, which detracts from the teaching that a proper sequence of subject might give.

James C. Powell.

THE PAINTED WINDOWS IN WINCHESTER, FAIRFORD, AND KING'S COLLEGE, CAMBRIDGE, AS MODELS FOR MODERN WORK.

Mr. President and Gentlemen,—

HOW far can we use the study of old painted glass in England for the foundation of new work here? This question has, I dare say, been asked by every artist who has studied the various ancient examples before he begins to design for glass. Ought he to keep the quaintness of the old drawing and compositions both in their conception and execution? How far is he to keep them if he improves the drawing and modernises the sentiment of the composition?

What are the best examples of colour? Ought white to predominate in masses,

over the masses of colour in English work? Take the light all the year round, what amount of paint covering ought the glass to have? Can it be well covered and rich, and yet, when the edifice is filled, admit sufficient light for use and for the proper vision of the other ornaments of the church, and the architectural mouldings?

These are but a few examples of the number of questions involved in preliminary study, and the necessity of their being considered as a whole will be evident to every one who has had to carry through a series of windows properly. One window in a large building may be played with, without much noticeable detriment to it, but when the edifice is filled it is sometimes so darkened that parts are obscured. Oftentimes we hear the advice "plenty of colour;" "cover the glass well;" "old glass is "brilliant, because so much is obscured that the clearer parts shine out like "diamonds;" "why should we wait years for the effect of old glass?" and other receipt-like meretricious remarks that those who have not experience and a knowledge of the necessities of the work will make, and make in all sincerity, from the simple reason that they have had continually to deal with a single window only, and have not considered the effect of a whole series in lighting a building.

I take it then that our first consideration in studying old work is the one I have placed last in my *catena* of questions, namely, the appropriateness of the glass to the church or other building as far as light is concerned; the second, as to the scale of the details in proportion to the building; and the third and most important artistic part, the composition and colour value. I purposely leave out that great consideration in a church, the theological scheme and iconography, because those should properly be settled (before building) by the theological and art authorities with the architect as one of the characteristics, involved to a certain extent in the arrangement of the windows; and I could point to old windows, the stone construction of which was especially designed to carry certain subjects which must have already been decided upon and sketched out.

To deal with my propositions in detail. The first object I would propose to the artistic architect, therefore, in studying old windows is, as I have said, the comparative amount of light they admit into the building. This involves the consideration of the size of the building, the size of the openings for light, the position of the church, and its locality (this has much to do with light), the amount of carving, painting, and other decorations which it is contemplated to introduce, and the comfort and warmth of the congregation; for a number of windows exposed to the cold air, unless they are in the chapels with inner glazing, as in King's College, Cambridge, makes the edifice comparatively cold in winter and warm in summer. But the point we now dwell upon is the quantity of light which the architect requires for the effect of his interior and the convenience of his congregation.

At Fairford [fig. 38] and King's College, Cambridge, the edifices are completely filled with painted glass, and in both there is, as I take it, plenty of light. The treatment of the work at Winchester Cathedral, which is but partially filled, for most of

Fig. 37.—Winchester College, *circa* A.D. 1480.

the old glass is destroyed, is very like that at Fairford. Winchester College chapel is full of glass, the greater portion badly copied from the old windows.

At Fairford the openings are moderately large and plentiful, the glass is fairly, but not densely, covered, and there is a very great area of white in the canopies and

FIG. 38.—FAIRFORD CHURCH, *circa* A.D. 1495-1500.

draperies. In King's College, Cambridge [fig. 39], I think, the openings are proportionately larger and more numerous; but, except in the "Barnard Flower" window, there is less white, and the painting is more dense; thus the general effects of both are more equalised.

If one would study a dark church with a light more fit for contemplation than reading, and where the massiveness of the detail does not require much illumination, I should send the student to Chartres on a dull day. Here he will at once perceive that

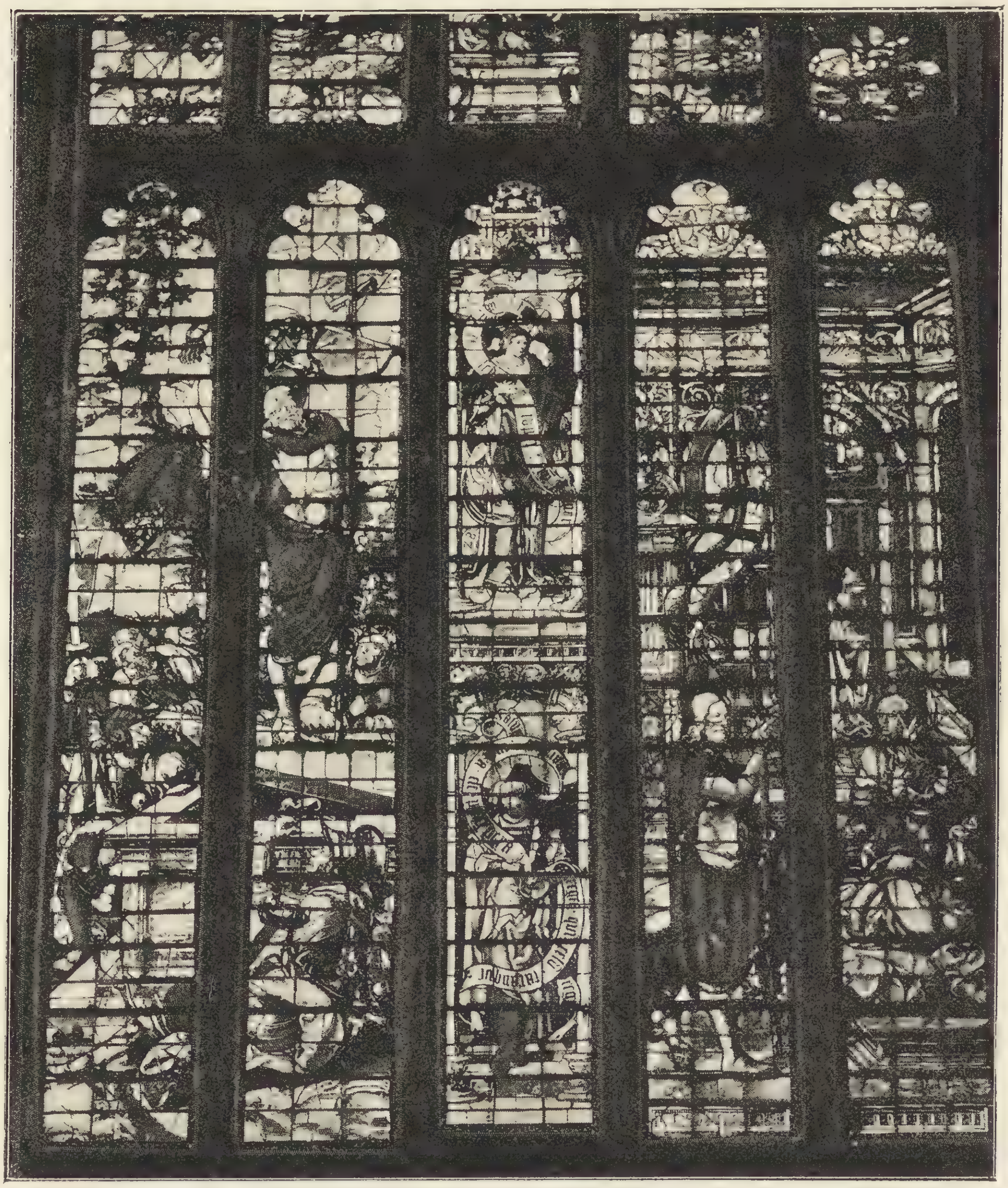

FIG. 39.—KING'S COLLEGE, CAMBRIDGE, *circa* A.D. 1520.

the sixteenth-century artists learnt by experience, for they observed, notwithstanding that the amount of shadowing pigment on the glass in these early windows is small, yet the obscurity of the glass is greater because the smallness of the details involved

so much lead and iron that an immense area, taken altogether, is perfectly opaque. It is vain for an architect or an artist to lecture or dictate as to how much pigment or colour shall be used until he knows whether all the windows will be done; he may then fairly calculate how much light there will be from the study of these and other ancient examples. If a number of pieces taken from ancient windows are compared with each other, it will be found that there is diversity in the amount of pigment used, and in the methods of using it. The proper character and quality of the painting on the glass, the quantity of pigment to be used, the amount of obscurity in painting on white and on colour, appear to have been but slowly arrived at by the artists in different countries. The earliest work is similar wherever it is found, but in the early years of the sixteenth century we find that the Northern countries used less pigment than the Southern, and on principle. Of the ordinary methods of painting the open stipple is more translucent than the floated mat; but the tar vehicle, generally used in finishing, causes the greatest obscurity. Generally speaking, our own glass of the best periods is as delicate and as translucent as any, or even more so, and a comparison can easily be made between English glass at Fairford, Winchester, and King's College, and the German and Flemish glass of St. Mary's, Shrewsbury, and Lichfield Cathedral. Between French and English work there is not a great difference of tone. The old glass in the nave aisles of Cologne is delicately painted, and the covering of the glass moderate. At Milan, although many of the master painters were German and one or two from Cologne itself, the covering of the glass and amount of colour are increased. At Florence it is still more obscure.

There is a lovely little window, I think, by Ghirlandajo, in one of the chapels to the right of the high altar of Santa Maria Novella, at Florence, which is exquisitely but darkly painted; this work is Florentine and Italian. At Bologna we have the works of B. Giacomo d'Ulma (a German), Lorenzo Costa, Peregrino Tibaldi, and other local artists, still more heavily painted than the Florentine work; but the glass was originally more crude and brighter. At Arezzo the old Italian glass is very obscure, whilst that done by William of Marseilles, a Frenchman, is quite a contrast, being like French glass in tone. At Venice the work of Vivarini in SS. Giovanni è Paulo is also very heavily painted and much enamelled. It is also a curious fact that the obscure pigment on Italian glass is very fugitive. The window in SS. Giovanni è Paulo has been twice restored, and some barbarians are talking of giving it a third chance of being destroyed. In Spain, much of the glass, indeed the greater portion of it, was executed by French, Flemish, and German artists, and it is consequently not adapted to the light of that country.

The painting on the glass in the different windows at Fairford is often unequal in tone; this inequality is sometimes accidental, but in most instances intentional. For example, I think the west window has more pigment on it than the aisle windows. It is large, and there is a considerable amount of white glass in it, which would stare and be unpleasantly spotted in certain sun conditions unless it were well covered. But, generally speaking, the diversity in covering the glass in Fairford Church is not

so apparent, nor so necessary, as in a large edifice like Winchester Cathedral. Here the fragments in the Chapel of Our Lady seem delicately worked, and so do the clerestory windows when seen from a fair distance, but the tracing lines of the latter when closely examined are very thick. Examine the hair on some of the heads with the aid of a field-glass, and you will find it very boldly lined. This strength of line gains delicacy by distance, and appears from the floor no bolder than the more proximate windows; moreover, it obviates the necessity of obscuring the glass by excessive shadow, as it sufficiently relieves and defines the parts with the assistance of a little modelling. The window from Winchester College, of which I give an illustration [fig. 37], now in the South Kensington Museum, affords a good example of the amount and character of the painting used in a chapel, with plenty of large openings at a fair distance from the eye.

In King's College, Cambridge, the difference between the chapel glass and that in the big windows again affords an excellent comparison by which to obtain a knowledge of the painting of the glass under different conditions. It must, however, be remembered, while studying the windows at King's College, that many of them have been lamentably and badly over-painted in restoration.

N. H. J. Westlake.

THE RENAISSANCE PERIOD, AND THE USE OF ENAMEL.

Mr. President and Gentlemen,—

ORIGINATING from *cloisonné* and *champlevé* enamel-work, glass-painting in its early form was an assemblage of small pieces of glass, heavy in texture and strong in colour. Its effect was rich and very sombre; and this is due, I think, in great measure to its enamel origin. Be it so or not, while the general tone of painted decoration seems always to have remained the same, glass paintings became steadily lighter and lighter as years rolled on. And this was the case both in England and France, and simultaneously with a growing divergence of style of design. The glass itself became thinner in substance, and the colour less intense, and a less quantity of coloured glass was used in proportion to the white. This change of material also admitted a thinner painted line and shading to be used; and so in all ways there was a progression towards lightness.

So when we come to the later fifteenth-century work we find a style of working arrived at which seems to embody principles which can never be again departed from without loss of effect, and by which extreme lightness, richness, and silveriness were obtained. It had been arrived at in the same way that the Greeks had arrived at their perfection in sculpture, and in about the same time.

The English work seems to me much more successful than the French at this

epoch. Instances of English work can be seen at Great Malvern Priory, at York, and at Fairford; and of the French at Saint-Maclou, at Rouen. But, admirable as this work is, I should not consider it the highest development of glass-painting. There is a certain limitation of design and conception, power of colour and drawing, as compared with work both before and after it. While the earliest glass is geometrical in character, the later Gothic is architectonic. The canopy work based on architectural models, successful though it is, palls at last by its endless repetition; and this the more, because occasionally one meets with examples of design of more original character and of equally good effect. There are interesting pieces of Perpendicular glass at Norwich, which are remarkable for originality of design and refined treatment. There, the pinnacle work is replaced by stiff foliage based on the stone carving.

The cause of the monotony, at least in France, I think must have some connection with the fact that whereas in earlier times glass-painting had been not only accounted an art, but one so esteemed as to confer nobility on its practitioners, in later times it had become very much a commercial matter, and work was turned out in enormous quantity. When in the sixteenth century the new ideas came into France from Flanders and Italy, glass-painting was thriving as to its technique, and well-developed traditions and sound principles were in use. We cannot, therefore, speak of the Renaissance of glass-painting; but we may say that the design, which had become somewhat mechanical, or so to speak stereotyped, was revolutionised.

It is natural to expect under the conditions existing at this epoch that *motifs* of ornament from Flemish and Italian Renaissance should have been taken up and expressed in Gothic technique, and such was indeed the case in glass as it was in stone work. In the city of Rouen alone, enough examples remain, many of them dated, to form a regular series of works, showing the transition going on at this time; and the earliest of them show just this use of Renaissance detail and arabesques, treated in the same technique as the Gothic canopies. In King's College Chapel, Cambridge, we have a similar series of *English* examples, but here the Italian influence seems less direct or less quickly received; the change is more gradual and the final result not so marked, and its merits, from an artistic point of view, are, I should say, inferior to the work in France.

Nor is this to be wondered at, for there were living and working in France, each for a time, such men as Lionardo da Vinci, Andrea del Sarto, Benvenuto Cellini, Rosso and Primaticcio, and a number of less known Italian craftsmen; and the French possessed such men as Jean Goujon, Germain Pilou, Jean Cousin, and Robert Pinaigrier. The enthusiasm and emulation among these men must have been as great as the patronage of the arts was liberal.

And our particular art was the more influenced because the line of separation between architect and sculptor, painter and glass-painter, was little marked. We find Jean Cousin, for example, the most prominent painter, and a glass-painter too. He was educated at Sens, among glass-painters, and was at once architect, sculptor, painter, and engraver, and possessed enough knowledge of anatomy and geometry to write

FIG. 40.—CHURCH OF SAINT-VINCENT, ROUEN.
(Reduced from a coloured drawing by Messrs. Clayton and Bell.)
Scale of about one inch to one foot.

treatises thereon. Windows at Saint-Gervais, Paris, and Saint-Godard, Rouen, are attributed to him. Though doubtless an exceptional man, he must be an example of the breadth of study in vogue, and it is to the largeness of view so obtained I attribute the power of the work done from about 1520 to 1550.

It was at this epoch that the glass of Saint-Vincent [figs. 40, 41], Saint-Patrice, Saint-Godard, and Saint-Nicaise was done at Rouen, that of Saint-Gervais at Paris, and that at Chantilly, Montmorency, and Ecouen; and many examples remain of Flemish work, of which that illustrated from Warwick Castle is an instance [fig. 42]. These works show a wondrous combination. The true principles of glass-painting—glorious colour, refinement, grace, and power of drawing; vigour of design, and individuality of conception—may all be found united in the same work. There seems to be such a grasp in every direction, that boldness and ease are natural, and the ideal of colouring seems set by Titian. Such work I regard as *fine art*; and the delicacy, no less than the power, leads to the conviction that not only artists indeed had been at work, but artists who knew all the technique of glass-painting, so that they could deal with it as an oil-painter deals with his canvas, though of course in a totally different way. It is coming from this work especially that the limitations of the fifteenth-century work make themselves felt.

But this epoch, the "Age of Gold" for glass-painting, as it has been described, was short. Even while the vigour of it lasted, warnings of its end are discernible, and little of any value can be found after about 1550.

The Italian influence, itself in degeneration, becomes stronger and stronger, and

displaces the growth from within. The glass-painter succumbs to the temptation of aiming to do in glass what he saw done in all paintings, and aims not at producing a beautiful glass-painting, but a picture full of strong contrasts in light and shade. Examples of this exist at Caudebec. The subject itself often crowds out all the ornamental framing which gave it value by contrast, and, indeed, we find subjects piled one on another with only an iron bar to separate them. The technique is interfered with to give the strong contrasts of light and shade desired, and so the grace and silveriness of glass is lost and the coloration sacrificed.

I have thus entered into the subject archæologically, because it is the only way to get clear ideas for our own practice; though, of course, I have only touched on the merest fringe of it.

But enough has been said to show that there are three distinct phases of work to consider: the first, where sound principles and traditions are in use, but with limited artistic power; the second, where these same principles are used *with* great artistic power; the third, where this power is misdirected and crippled by the abandonment of these true principles. Let us linger on the middle phase, and seek to gather instruction therefrom. And, if I mistake not, the result of such study will lead to the following conclusions being brought out:—

1. That the material itself, unique among all materials, demands that certain principles shall be adhered to as the only means of success, the neglect of which will surely lead to the loss of effect, whatever artistic power may exist. These principles were fully understood at the end of the fifteenth century, and were the result of centuries of growth and accumulated tradition.

Fig. 41.—Church of Saint-Vincent, Rouen.
(Reduced from a coloured drawing by Messrs. Clayton and Bell.)
Scale of about one inch to one foot.

Fig. 42.—Flemish Glass on the Staircase at Warwick Castle.
(Reduced from a coloured drawing by Messrs Clayton and Bell.)
Scale of about three inches to one foot.

2. That the mere knowledge and use of these principles, without individuality of conception and the personal care of an artist, will only lead to monotony of design and commonplace repetition of a few types; and this personal artistic care must not stop at the design, but must be carried through every step of the execution of a window, if grace and quality are to be obtained.

The breadth of study also which seems to have been customary among artists of the Renaissance, both in Italy and France, by which they were each exercised in many directions by working on different materials, is, I think, worthy of attention, and I notice that M. Lucien Magne, architect, of Paris, who has closely studied sixteenth-century glass, expresses himself thus: "The first cause of the inferiority of modern "work appears to me to be in the isolated instruction of the arts. For three centuries "art has been in a way specialised. Theoretical teaching having been given still "recently from the point of view exclusively of form, and independently of all idea of "the *ensemble,* no principle of decoration could be deduced from it." *

There were a few introductions in technique made at the Renaissance period which call for notice, as they had great influence on the effect. The pot-metal colours were much extended in range—purples, violets, and greens especially. This was due to the system of *plating* one colour over another. The silver stain was made to produce not only yellow, but orange and red, and much of the warmth and richness of Renaissance glass is due to this. The brown painting colour also was supplemented by a *red* painting colour, and this is used so as to give effects of the greatest richness and value. Finally, about 1540, transparent enamels were introduced; and they had such an influence on the work, and are so specially a Renaissance feature, as to call for some particular mention. The series of windows at the Imperial Institute I designed, at Mr. Collcutt's request, with the employment of transparent enamels in view, and this work led me to specially study the ancient use of it at Rouen and elsewhere. These windows at the Imperial Institute give some idea of the possibilities of the delicate colour effect obtainable by the use of enamel for modern work.

Mr. Winston expresses the opinion: "The difficulty of introducing colour into "glass-paintings, without the use of lead-work, seems to have been always considered "as a disadvantage, and no doubt sensibly affected the designs of the middle "ages." † Especially in heraldry, where small pieces of colour are a necessity, was this the case, and he gives several examples of false heraldry due to this cause. The means taken to overcome the difficulty consisted in fusing small pieces of coloured glass on to the white glass, and grinding away parts of flashed glass.

So early as the date of the MS. of Theophilus, namely, the twelfth or the thirteenth century, we find instructions given for "placing gems on glass." It is there stated: "If "indeed you wish to make on the painted glass, in the crosses, in the books, or in the "ornaments of the draperies, gems of another colour, without lead, viz. hyacinths and

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* *L'Œuvre des Peintres Verriers Français.* Fo. Paris 1885. Text, pp. xxxii-xxxiii.

† *Hints on Glass-Painting.* 8o. Oxford. Pt. 1. Text, p. 28.

"emeralds, do thus;" and how small pieces of glass are to be cut out and put on the white glass and melted on to it is also described.*

Various examples of this are known, but it is a very unsatisfactory method, both from the labour necessary and the uncertainty of its result. The use of fluoric acid has done away with the necessity of grinding, and this is of great use. But after all there is nothing but the use of transparent enamels which gets over the difficulty, of which it appears glass-painters had been sensible all along. It is easy to imagine, therefore, that artists of the sixteenth century would welcome any means that offered of arriving at a solution of the problem, and this the more when glass-paintings began to be used for the windows of châteaux decorated in the refined manner of the Renaissance.

It seems probable that the application of transparent enamel to glass arose through the use of enamel in goldsmiths' work. Indeed, we find a receipt in the Bolognese MS., dating in the first half of the fifteenth century, thus translated by Mrs. Merrifield :—
"To paint glass, that is to say cups or any other works in glass, with smalti of "any colour you please. Take the smalti you wish to use, and let them be soft and "fusible, and pound them upon marble or porphyry, in the same way as the goldsmiths do," &c.†

Whether the idea came complete from Italy, or the French themselves adapted the enamels to glass from the enamelled jewelry and pottery so much in vogue, it is difficult to say, but the use of it is quite in accord with the times. Nicolas Pinaigrier, of Rouen, was one who gave special attention to them. At Rouen were notable potteries, and the tiles made there show much Italian influence; and there we find enamel on glass somewhat extensively used in church windows in conjunction with pot-metal glass. In Saint-Patrice, Rouen, there is a series of windows so treated, dating about 1540. I find also windows as late as 1624, consisting of a grisaille treatment with enamel colour and single figures strongly worked in pot-metal glass. I am led to think the use of enamel in rivalry to pot-metal glass only arose because the small demand had made it impossible or difficult to get the pot-metal glass.

Enamel colour alone, however, was used in the sixteenth century in small quantities for panels and medallions for domestic use; several very fine specimens are in the museum at Rouen, and we have some of a later date at Kensington. Enamel was also used in Italy by Giovanni da Udini at Florence in 1560, and in England from the time of Elizabeth. A very great number of the small Swiss heraldic panels seem to have been made, and also of the small ovals of Dutch origin. Both of these are suggestive of what can be done with enamel for domestic use.

But though enamel on glass has been thus extensively used, it is sometimes urged that its use is illegitimate. I think this arises partly from the fact that in

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* *Hints on Glass-Painting.* 8o. Oxford. Pt. 1. Text, p. 337.

† *Original Treatises, dating from the XIIth to the XVIIth Centuries, on the Arts of Painting, &c.* 8o. Lond. 1849. Vol. ii. p. 528.

certain cases it has come off the glass, thus leading to the idea that it must always necessarily come off; and partly because it has been misused, as in the case of the Oxford window designed by Sir Joshua Reynolds. But this is due to ignorance or lack of skill.

Enamel is glass, and glass a silicate or a combination of silicates. It is a chemica compound, and chemists know well that silicates are not all of the same value in power of resistance. It depends, therefore, what kind of silicate is used, or what combination of silicates, whether the enamel is resistive or not. The earlier glass-painters had reliable traditions to work by—hence the enamels done in 1540 are sound to-day; but the later glass-painters had lost these traditions, or they had become obscured—hence their work has failed. I have noticed in those few cases where the transparent enamel has failed, the opaque pigment has also failed, showing a lack of knowledge or skill. It is to be remarked that the only difference between a transparent enamel and the usual painting colour is that one is transparent and the other is rendered opaque by some dense material mixed with it. If we have not tradition to-day we have what is still better, namely, such knowledge of chemistry as enables colours to be built up atomically and tested when made. I think, however, it is much more difficult to fire coloured enamels properly than the opaque enamels.

As to the artistic value of enamel, it must be at once said that any attempt to use enamel colour in large quantities in rivalry to pot-metal glass must stand condemned. It is, so used, an inferior result obtained by a roundabout way. But employed in conjunction *with* pot-metal glass, I consider it may be of great value if used with taste and discretion. For domestic work we see by the old examples how it can be a means of rendering colour in a refined and delicate way in harmony with modern interiors, which, I think, is certainly not the case with leaded colour. The colours of enamels as generally made are crude; but there is no necessity for this, for most of the gradations made in glass itself can be made in enamel pigment, and it may be just as transparent. But as it is an added power, so it requires added judgment to use it; and without artistic judgment and the restraint of good taste it would be more than likely to lead to very unsatisfactory results.

CLEMENT HEATON.

ABSTRACT OF THE DISCUSSION.

MR. ALMA-TADEMA, R.A. (*H.A.*), considered that the vast development of art feeling everywhere was largely due to the people going to churches and seeing those wonderful combinations of colour and figures, those striking pictures for the teaching of religion which had always been so intimately connected with the arts, and which was so still wherever people were righteous. So it was quite natural

that the greater part of the Papers which had been read should have been devoted to the religious expression of stained glass, while perhaps the question of using a stained-glass window as an ornamentation in ordinary domestic architecture had not been touched upon so much as it was often asked for from the architect. In towns, for instance, where one had a window opposite a blind wall, it was a great advantage to have the window filled with stained glass. There was a man in America—Mr. John Lafarge—who had done some very nice things in that way. He had taken as a model those Oriental windows with rather thickly cut pieces of glass of different colours, which produced a wonderfully fine effect—so fine that a friend describing the window to another friend said, "Look here, they are all cut jewels!" There was another point to which he wished to draw attention. How old was the use of coloured glass for windows? He believed the old Romans had stained glass too, and he knew that there was in a little house in Pompeii a piece of sheet-glass of a beautiful purple colour embedded in the wall. It was a broken piece, and they must have had big sheets of glass and coloured panes as well as white ones, of which many still existed. In another house in Pompeii there was a fountain, the sides of which were simply dabbed over with remnants of those beautiful bowls of different colours of which so many pieces were seen in museums; they had been simply remnants picked up and put into the cement while it was still wet, and it made a beautiful decoration.

The Rt. Rev. Lord ALWYNE COMPTON, D.D. (*H.A.*), was especially delighted to hear Mr. Powell denounce wires outside painted glass windows. When he put a painted glass window in his old parish church he had insisted upon having no wires, because, as Mr. Powell had said, an occasional crack was far better than having wires constantly in front of the window. There might be some reason for putting up wires to protect ancient windows, because an ancient window if broken could not be replaced; but why they should be put to modern windows he failed to see. He did not wish to undervalue modern windows, but an artist who painted modern windows could repaint a modern window. One point that was very often forgotten was that light was needed upon certain parts of the interior of a building. Very often in a church that which was most beautiful, it was naturally considered, must be towards the east end, and must gradually work towards the west; and, as a rule, the result was that the east end was perfectly dark, while the nave and other parts of the church were perfectly light, so that one looked into a dark hole. That was obviously a great mistake, and it might be very important to use a good deal of very white glass in the eastern parts of the building. The great object of glass should be glory of colour; and white windows, though they were exceedingly beautiful, very often failed in the proper effect of painted glass. If, for instance, they were windows from which the light came upon the altar, he should be very glad to see them there; otherwise the use of glorious colour was the whole principle of glass, much more than the beauty of the drawing. If he were not mistaken, Theophilus gave the direction that in order to make blue glass they must grind down sapphires. There could hardly be a doubt that the sapphires in question meant Roman blue glass, and not the precious stones usually called sapphires,

which would be an absurdity. The Romans, it was known, did make most beautiful coloured glass, and so did the Greeks before them, and very likely used it in their windows.

Mr. T. G. JACKSON, A.R.A., thought the art of glass-painting had an unusual share of those perils which besieged the arts practised by all of them—that was to say, the danger of lapsing from art into archæology. They had before them, in designing or considering the subject of glass, the whole of the periods of painted glass in England and other countries, which were all well known now; and one of the difficulties was, amongst such an unusual amount of material, to select what there was in the past which was suitable for adoption and for still further development. In England and France, having discovered, as they did very early, the means of making extremely rich and brilliant colours, they seemed to have gone to the very extreme, and to have thought they could not make the colours rich and heavy enough; but while they recognised the wonderful mystic charm of such glass as that at Canterbury and Chartres—glass which was full of mystery, and perhaps stirred the imagination more than that of any other period—they must see that it would be impossible for them to do anything of that kind. It used to be said that they could not get the glass to do it; that, he thought, might be dismissed, because the production of any kind of glass was not beyond the range of the resources of modern chemistry. But even if they got the glass, he was quite sure that they could not get what was more important—namely, the habit of mind which enabled the artists of those times to produce such designs. They could not abstract their minds and work in that simple and naïve manner which to the old workers had been natural, but which in them would be mere affectation; and without that, it would be impossible to produce glass of that kind. The most useful glass for present study was, he thought, the later glass, where they got more perfect designs and a higher form of art, although perhaps not the same gorgeous and entrancing effects of colour; and it seemed to him that from the very first there was one lesson to be learnt in the history of stained glass, and that was how they gradually worked from a very dark and heavy style to a lighter style, till, finally, they came to glass which, as Mr. Powell told them, was sometimes two-thirds white to only one-third of colour; and that was a lesson which they could not afford to lay on one side. For modern use the lighter glass was the most useful. In their fathers' time it used to be said that painted glass was a forgotten art; but it was discovered again, and it might be pushed too far. He hoped that it might not be thought always necessary to fill every window in a church with painted glass. Many interiors owed a great part of their charm to the pure light, or it might be the dusky light, that came in from windows glazed with ordinary glass. Nothing that had been done lately in Westminster Abbey in the way of filling the clerestory with painted glass compensated, to his mind, for the loss of that wonderful light which used to steal in by the clerestory windows through the dusky and somewhat murky atmosphere that filled the Abbey, producing the most exquisite effects; all that was now lost, and, to his mind, what had been done was loss rather than gain. In town churches there might be good

reason for using stained glass more extensively; when, as Mr. Alma-Tadema said, a blind wall existed in front of a window, it might be desirable to hide it, but in country churches stained glass must be very good indeed if it were to compensate for the loss of the sight of the blue sky and the green trees. There were, of course, instances of large churches in the country with stained glass entirely, which had a satisfactory effect; but in small churches it ought to be used with a little more discretion than it sometimes was. In both the great churches in Nuremberg—the Sebaldskirche and the Lorenzkirche—there were windows which in the lower parts were filled with stained glass, rich in colour, but not carried up to the head, finishing part of the way up with some sort of canopy, the remainder of the window being filled in with ordinary white glass; and the effect was admirable. Another instance was in one of the chapels at Oxford. In Wadham College chapel there were on each side of the choir five transomed windows. The lower part below the transoms was filled with painted glass, the upper part with ordinary window-glass; and the effect seemed to him to be extremely pleasant. The work was of the date of the year 1622. The chapel was perfectly light, and at the same time a very rich effect of colour was obtained by the amount of painted glass in the lower parts of the windows. Of course, if glass in such a position as that had been painted very heavily it would look dirty; but in that case, to his mind, it was treated with great success.

Mr. HENRY HOLIDAY said no great artist had ever succeeded in doing anything good by imitating that which had been done before him. Art was growth, and each artist at any of the old periods when great work was produced had done what he did, not as an imitator, but as a producer. It did not of course follow that every development was an improvement, but he thought that any artist worthy of the name would rather make a few technical errors in his art than produce lifeless work: for mere imitation must always be absolutely lifeless. All good artistic work must express the ideas of the man and the ideas of the time. Thirteenth-century work was modern; Giotto was modern; Michelangelo was modern; every great man must be modern. Such a man had learnt from the past, but he spoke, painted, and carved that which was his own thought, and not the thought of somebody before him. One great question which came home to the artist in dealing with the decorative arts was: How far could realism be united with true architectonic principle? There was a certain confusion of ideas often met with in discussing the subject with outsiders, and that was that if a piece of decorative art were not archaic in character it must be an imitation of an oil-painting. All knew that what was called the Munich School had wholly failed, by attempting to make stained-glass windows imitations of oil-paintings. They failed in the way that the Gobelins tapestries failed—in endeavouring to make one material imitate the effects of another material; they failed, of course, to get the effects of the other material, and they sacrificed all the beauty of the material with which they had been dealing. The question then arose, How far can an artist be realistic without failing in his architectonic qualities? In his opinion, this was a question which would settle itself for each artist if he remembered that he had to consider his material, that he

had to consider his situations, that he was working for a window and not painting on a wall, that he was working in transparent glass joined by leads, and not with oil-paints. If an artist kept those things clearly in mind, then he would never fail by attempting to secure all the interest that could be obtained by imitating beautiful forms in outline and even beautiful forms in modelling. Had any one who had examined the frieze of the Parthenon thought that the splendid decorative qualities of that frieze were in the slightest degree sacrificed by its most beautiful imitation of the forms of horses and of human beings? In the thirteenth century, as well as at the present day, some of the greatest beauties of art had been obtained by what was to the artists of that day realism. If they compared the stained glass of that period with the miniature painting of that period they found precisely the same qualities in both. It was clear that the thirteenth-century artists imitated to the best of their power, but the fact that they could not imitate as accurately as was now done detracted to some extent from the perfection of their forms; but, on the other hand, it left those artists a little freer to consider the mere technical qualities of the material, the jewelled beauty of the glass. If modern artists aimed at similar delicacy of detail of the surface, it might be that they sacrificed something of that jewelled splendour. But was there anything in the delicate play of tone about such figures as those by Mr. Burne-Jones which would not add to rather than detract from the beauty of the glass for which they were prepared? It was sometimes said that the beauty of the old glass was owing to the effects of age, which was to some extent true, but not absolutely true. The play of colour which the action of weather and the mellowing effect of age gave to glass was no doubt a beauty. To imitate it by the mechanical process which used to be called "antiquation," and which was not recognised now by any glass-painter, was a miserable and puerile process. But to get all that play on mail-armour added not only to the beauty of the figure, but to the beauty of the glass, by developing its charm by the play and glitter which it gave. In that respect, always under the strict guidance of the consideration of the material and of the situation, and of the technical and architectonic qualities, realism was good. It gave intelligent beauty to the glass in place of the merely mechanical affectation of those who at one time thought their one aim should be to imitate thirteenth-, fourteenth-, or fifteenth-century work. There had been a very interesting departure in America in the way of stained glass by Mr. John Lafarge, to whom Mr. Alma-Tadema had referred. Mr. Lafarge's system was one by which an enormous amount of interest was put into the material itself by the way in which it was dealt with. He agreed with all that Mr. Alma-Tadema had said about its wonderful jewelled effects; but he was bound to say that for monumental works in churches it was emphatically not useful. He had had a long talk with Mr. Lafarge, and saw a great deal of his work in America, and was strongly of opinion that Mr. Lafarge was a genuine artist, and that all he had done in that new departure arose from a strong, artistic, instinctive desire to produce the very best work he could. In the glass which he and others in America—Mr. Tiffany and others—now produced, there was absolutely no work whatever on the glass itself, except that they were obliged to paint the hands, feet,

and features; those were painted and fired, but all the rest was glass leaded together. The consequence was that a wonderful glow and splendour of colour was produced, but everything within the leads depended absolutely upon the accidents of the glass. It was such work as one might readily accept in the window of a house, and was full of charm and beauty; but when an artist had a great figure design, and was absolutely precluded from putting the lines of his drapery in the place where he wanted them, and when everything depended upon the glass-worker being able to select suitable pieces of glass, what followed? Accident was substituted for design. The true artist ought to be able to utilise accident, and when the accident was under his control he would produce more beautiful effects, but in that work of which he had been speaking the artist was the slave, and not the master, of the accident; and, interesting as it was, and full of artistic feeling as it was, he believed that Mr. Lafarge's work proceeded on a wholly mistaken theory of art.

Mr. C. W. WHALL referred to an experimental practice which he adopted, and which was that of designing a window in glass itself. He made a sketch of the window in glass, cutting the pieces out on a small scale to an inch-scale tracing. He looked upon it as one of the most valuable things said that evening—that whatever qualities stained glass might have, a *sine qua non* was gorgeous effect of colour; and he did not see how such effects were to be treated merely by the light of theoretical experience, however deep that might be. He considered it almost essential to put the glasses side by side, as an experiment, before putting the numbers on the cut lines by which they would take their places in the window.

Mr. LEWIS F. DAY said that, with regard to the influence of style upon design in stained glass, people in general, and perhaps architects in particular, were a little too much inclined to insist, for a church, upon precisely the style in which the glass-workers of the period to which that church belonged worked. Of course, every artist who designed painted glass, if he were an artist at all, did instinctively consider the style of his architecture, and he must do so; but that was quite a different thing from insisting that he should work in the style in which the glass-workers of any particular period worked. The artist in stained glass (as in everything else) should be master of all that had been done in glass in every period. He should also study styles of architecture. Being conversant with those two things, he should do the best he could with his glass, bearing in mind its surroundings, but that did not necessarily mean that he was to do what had been done by the glass-painters of any particular period.

XCIV.

BYZANTINE ARCHITECTURE. By George Aitchison, A.R.A., Professor of Architecture at the Royal Academy ; *Vice-President.*

Mr. J. Macvicar Anderson, *President,* in the Chair.

Mr. President and Gentlemen,—

THE architects of Christendom are now at school, endeavouring to discover the methods by which mere building has been converted into architecture in every country of the world. They are interrogating every architectural monument from the rudest to the most perfect, in the hope of making this discovery, so that when it is made, they may take the step forward towards a style characteristic of modern civilisation. Under these circumstances, I trust you will listen to a sketch of the beginning and progress of Byzantine architecture, which lasted for 1,123 years, was at one period spread over the whole of the civilised world, was the immediate precursor of Romanesque and Saracenic, and greatly influenced Mediæval architecture.

I admit that archæology is for architects a mere innocent recreation, and if I thought that what I am saying to-night would have no influence on our architecture, I should leave you to get your recreation in some more agreeable form; but I believe this study may be useful to us in different ways. In Byzantine architecture we see the gradual adaptation of the plans of antique buildings to the ritual of a new faith; the universal adoption of the dome, without and with a drum; the successive devices by which the equilibrium of the dome was at last attained; and those æsthetic problems solved, by which the new constructive features were brought within the pale of architecture. We are also led to analyse one masterpiece of internal effect, the great St. Sophia, for whoever proposes to create a masterpiece must study one at least of those that exist.

In describing Byzantine architecture we are at the outset met by two difficulties: first, as to the date of its beginning, and, secondly, as to its chronological sequence. I have taken for the date of its beginning the dedication of Constantinople, on the 11th May 330 A.D.; but the monuments and buildings erected there by Constantine's orders were of the Roman architecture of his day, and were probably designed by Roman

architects. As regards the Senators' houses, they were copied by the Emperor's orders from their mansions and villas in Rome and its neighbourhood. The Circus began by Septimius Severus was only completed by Constantine. All the monuments he had built at Constantinople were executed in such haste, that those that were not burnt, or shaken down by earthquakes, became so ruinous that they had to be pulled down by his successors. All that remains of his day are the buildings he left in Italy Salonica, and the East—namely, his triumphal arch and the Basilica of Maxentius he had finished at Rome, the Church of St. Marcellinus and St. Peter, and the churches or tombs he had built in honour of his mother Helena and his sister Constantia. We only know his Baths at Rome from Palladio's drawings ; there is his triumphal arch at Salonica, and the Basilica his mother Helena had built at Bethlehem. His Golden Temple at Antioch was shaken down by an earthquake, and his church over the Holy Sepulchre was destroyed by Chosroes II. He presented to the Church the private Basilica of Lateranus, now St. John Lateran, the Vatican Basilica, now St. Peter's, and he had built the original part of the Basilica of San Lorenzo outside the walls of Rome, the Palace of the Chalce at Constantinople, and some say the Triclinium of Magnaurus. Eusebius, the Bishop of Cæsarea in Palestine, who wrote a laudatory life of Constantine, mentions the following buildings as having been ordered by him : the Church of the Holy Sepulchre at Jerusalem, the churches at Bethlehem and the Mount of Olives, a royal tomb for his mother at Rome, a church of the Martyrs at Constantinople, a church to the Saviour at Nicomedia and one at Mambre, a church at Heliopolis in Phœnicia, on the site of a temple to Venus, churches at Gaza and at another place in Phœnicia, and the Church of the Apostles at Constantinople, where he was buried. This church, rebuilt by Justinian, was destroyed for the Mosque of Mohammed II., but it had been nearly ruined by an earthquake.

The greatest thing Constantine did for architecture, and for the numerous arts connected with it, besides his buildings, was to enact that all persons in North Africa and Italy who had sons eighteen years of age and of liberal education, should be freed from taxes, if they allowed their sons to be brought up as architects ; and these students were to be paid a competent salary. The artificers who settled at Constantinople, and brought up their sons to their business, were also to be freed from taxes; the list of occupations, including architects, doctors, and veterinary surgeons, amounted to thirty-six.

We may as well give a glance at the state of Roman architecture in his day, and in the time of his predecessor, Diocletian. Domes, beginning with that of the Pantheon, existed at Rome, in the Baths of Titus, of Caracalla, of Diocletian, and in his own Baths ; of what date that of Minerva Medica may be, I know not. In the great groined halls of the Baths, and in the Basilica of Maxentius, the continuous entablatures had disappeared, and nothing of them was left except an isolated piece over each column, that bore the groins of the vaults. At his own Baths is to be found the first instance, I think, of the use of flat apses to abut groined vaults. The proportions of doorways and openings were mostly execrable; and every moulding, often every flat surface, was overlaid with

bad ornament; but there had been a constructive improvement, namely, from a ratio of solids to voids of ·176 at Caracalla's Baths, to ·167 at Diocletian's [Gwilt].

At Diocletian's palace at Spalato, arches had been sprung, without even a block, from the caps of Corinthian columns; and according to M. Choisy the dome of the Temple of Jupiter in that palace was built without a centre.

As to the sequence in date of Byzantine buildings, we are absolutely in the dark, from Constantine's death in 337, to the days of Justinian. For the list of Justinian's buildings we have the account by Procopius; after that date they can only be guessed at by the absence or presence of particular features dependent on ritual, improvements in construction, or a new departure.

The causes of this are not far to seek. Byzantine architecture has been looked down on and neglected; the dates of its buildings—if to be found at all—are mostly in Greek, and in ecclesiastical treatises. The difficulty of visiting the places where the most important monuments of Byzantine architecture were to be found was great, and free access to them was difficult, owing to their being used for mosques. The destruction of documents by war has rendered direct knowledge impossible, while a knowledge of modern Greek and Eastern languages was rare. The difficulty of visiting the sites and of free access to the monuments is fast disappearing; but I fear the knowledge of ancient Greek is fast disappearing too, and I do not know if the knowledge of those modern languages that are wanted is progressing. I presume that all archæologists are aware of the importance of the study of Byzantine work for the elucidation of this important chapter in architectural history. We cannot, however, be surprised at our ignorance, when we consider how little is known of classic archæology, which has been the staple of architects for close upon five hundred years. It is necessary to be a prophet to point out all the uses of this study for architects, as we know not whether our roofing problems in incombustible materials are to be solved hereafter by concrete and iron, or by the old methods, namely, by stonework, brickwork, and rubble. But, whichever it may be, the study of Byzantine buildings, in the present condition of architecture, must be useful, if it be not imperative. If we are to be skilful, we must study the adaptation of the plans of buildings to new wants, the expedients to be adopted when new methods of construction are tried and new æsthetic problems require solution.

I will now give you the description of an early Christian church; and I am able to illustrate it with a plan [fig. 43] which is a reproduction of one of the late Professor Cockerell's drawings.

Eusebius of Cæsarea was made a bishop in 315 A.D., two years after Constantine's Edict of Milan gave liberty of public worship to the Christians. During the time he was bishop he delivered an address on a church built at Tyre by the Bishop of that city; and we can judge of certain parts of it by his words, which are as follows:—

Thus then embracing a much wider space, he strengthened the outer enclosure with a wall to compass the edifice, that it might be a most secure bulwark to the whole work. Then raising a large and lofty vestibule, he extended it towards the rays of the rising sun; presenting even to those standing without the sanctuary a full view of those within, all but turning the eyes of those who are strangers

to the faith, to contemplate its entrance. . . . And on entering within the gates, he has not permitted you to enter immediately, with impure and unwashed feet, within the sanctuary; but leaving an extensive space between the temple (the nave) and the vestibule, he has decorated and enclosed it with four inclined porticoes around, presenting a quadrangular space, with pillars rising on every side. Between these he carried round the frame latticed railing, rising to a proportioned and suitable height, leaving, however, the middle space open, so that the heavens can be seen, and present the splendid sky irradiated by the beams of the sun. Here, too, he has placed the symbols of the sacred purification, by providing fountains built opposite the temple (nave), which, by the abundant effusion of their waters, afford the means of cleansing to those that proceed to the inner parts of the sanctuary. And this is the first place that receives those that enter, and which at the same time presents to those that need the first introduction both a splendid and convenient station. After passing also this sight, he has made open entrances to the temple, with many other inner vestibules, by placing again three gates on one side towards the rising sun. Of these he constructed the middle one far exceeding those on each side in height and breadth, embellishing it at the same time with exceedingly splendid brazen plates bound with iron and decorated with various sculpture, superadding them as guards and attendants to a queen. In the same way, after disposing the number of the vestibules, also with the porticoes on each side of the whole temple, he constructed above these, different openings to the building for the purpose of admitting more light; and these lights or windows he also decorated with various kinds of ornamental sculpture. But the royal temple itself . . . it appears to me to be superfluous to describe the dimensions, the length and the breadth of the edifice, the splendid elegance, the grandeur that surpasses description, and the dazzling aspects of works glittering in the face of the speaker, the heights rising to the heavens, and the costly cedars of Lebanon resting on these. . . . When he had thus completed the temple he also adorned it with lofty thrones, in honour of those who preside, and also with seats decently arranged throughout the whole; and at last placed the holy altar in the middle. And that this again might be inaccessible to the multitude, he enclosed it with frame lattice-work, accurately wrought with ingenious sculpture, presenting an admirable sight to beholders. And not even the pavement was neglected by him, for this too he splendidly adorned with marble, and then proceeded to the rest and to parts out of the temple. . . . He provided spacious *exedræ* and *oeci* on each side, united and attached to the cathedral (palace), and communicating with the entrance to the middle of the temple. . . . Building, therefore, in righteousness, he divided the strength and means of the whole people, according to a due estimate. With some, indeed, he surrounded only the exterior enclosure, walling it up with an unwavering faith. . . . But, allowing others the entrance into the edifice, he directs them to stand at the doors and to conduct those that are entering, who, not improperly, are compared to the vestibules of the temple. Others, however, he has supported by the first pillars which are placed without, around the quadrangular hall, by initiating them in the first elements of the literal sense of the four gospels. Then he also stations around, on both sides of the royal temple, those who are yet catechumens, and who are yet making progress and improvement, though not very far separated from the inmost view of divine things enjoyed by the faithful. Receiving from among these the souls that are cleansed like gold, by the divine washing, he likewise supports and strengthens these with columns far better than those external ones, namely, by the inner mysteries and hidden doctrines of the Scriptures. He also illuminates them by the openings to admit the light, adorning the whole temple with one grand vestibule of adoration to the one only God, the Universal Sovereign. Exhibiting, however, as the second splendour, the light of Christ and the Holy Spirit on each side of the Father's authority, and displaying in the rest, throughout the whole of the building, the abundance and the exceeding great excellence of the clearness and the brilliancy of truth in every part. Having also selected everywhere and from every quarter the living and moving and well-prepared stones of the mind, he has built a grand and truly royal edifice of all, splendid and filled with light within and without. . . . But in this temple there are also thrones, many seats also, and benches, in all the souls in which the gifts of the Holy Spirit reside, such as anciently were seen in the holy apostles and their followers, to whom cloven tongues as of fire appeared, and sat upon each one of them. But in the chief of all, Christ Himself perhaps resides in His fulness. In those that rank next to Him, each one shares proportionately in the distribution of the power of Christ, and of the Holy Spirit. There may also be seats for angels in the souls of some who are committed to the instruction and care of each. Noble and grand also, and unique is the altar, such as should be at least,

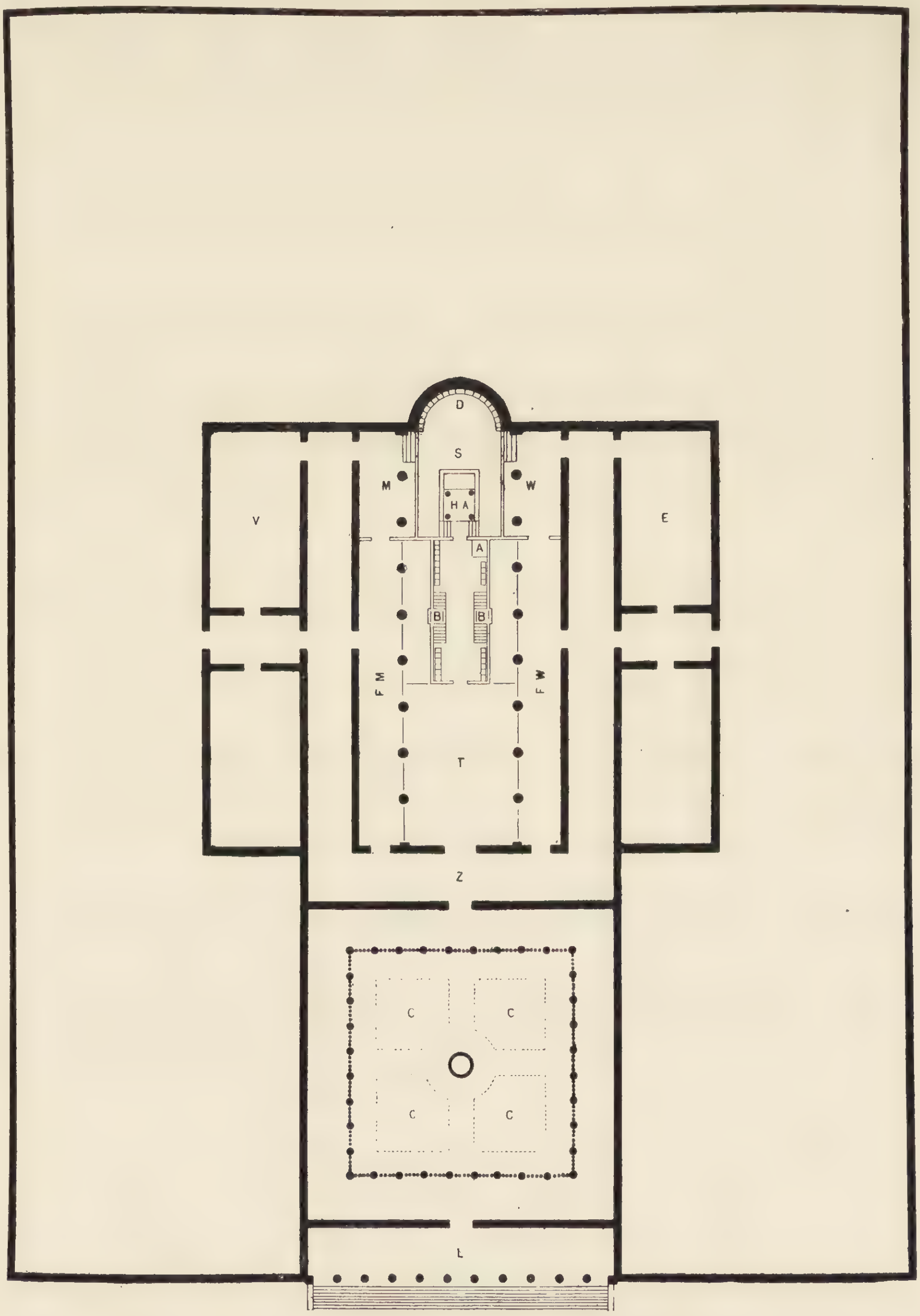

Fig. 43.—Model Plan of an Early Christian Church.

A, Emperor's seat. B, *Ambones*. C, Mystical trees and plants. D, Bishop's seat. E, *Evangelium* (where the sacred books were kept). F. M., Faithful men. F. W., Faithful women. H. A., Altar. L, *Lugentes*. M, Privileged men. W, Privileged women. S, *Presbyterium*. T, *Stantes*. Z, *Audientes*. V, *Vestiarium* (where the sacred utensils were kept and the priests dressed).

that sincerity and Holy of Holies, of the mind and spirit of the priest of the whole congregation. That great High Priest of the universe, Jesus, the only begotten Son of God, Himself standing at the right, receives the sweet incense from all, and the bloodless and immaterial sacrifices of prayer, with a bright and benign eye ; and with extended hands, bears them to the Father of Heaven and God over all. . . . Such is the character of this great temple. . . .*

You see by this that the churches faced east, like those of St. John Lateran and St. Peter, and the priest faced the congregation ; the right and left sides of the altar were the priest's right and left, and the south and north of the church, the right or south aisle being devoted to the men, and the left or north to the women. There was an ambo on each side, the gospels being read from the right or south ambo, and the epistles from the left or north. When in the fifth century the orientation was reversed, and the priest stood with his back to the congregation and faced the east, the sides of the altar remained as before. The gospel was still read from the old right, now the north, and the women still had the old left, as may be seen in Sant' Apollinare Nuovo at Ravenna, where the procession of virgins is on the north side, showing that the women, who had to contemplate the saints of their own sex, were on the south.

In the Orthodox, or Greek Church, the altar was mostly placed in front of the apse, on a raised floor, called the bema, and the apse itself was called the presbyterium, or place for the elders, and was surrounded by a seat or seats, with a more important central one for the bishop ; this arrangement existed, and I believe still exists, at Santa Fosca at Torcello, and is preserved in the Orthodox Church to this day. On either side are two rooms or chapels called parabemata ; the one to the north is the prothesis or Chapel of the Credence, and that to the south the diakonikon or Vestry, and the whole is enclosed by the ikonostasis. Of the pure basilica type, called by the Byzantines in the form of a circus, are the Church of St. John Studios at Constantinople, that at Dana, the Church of the Virgin, called by the Turks Eski Djouma, and that of St. Demetrius [fig. 44] at Salonica. This last church has the Tau, Tee, or original cross form, marked by two enclosures, one on each side of the bema. There is also the Basilica at Bethlehem, but the basilica type did not find favour, except in Italy and the West. The circular church of St. Marcellinus and St. Peter, built on the plan of the Temple of Portunus at Ostia, is imitated at St. George's, Salonica, only this has a deep sanctuary and an apse, and, by the way, has two flying-buttresses, though of what date I know not. San Vitale was built, it is said, on the plan of Constantine's Golden Temple at Antioch, and is octagonal externally. The Church of St. Sergius is square externally ; and many churches, chapels, and baptisteries are of all sorts of shapes.

It may be well now to say something of the domes on pendentives. Where these were first used in the Byzantine Empire we do not know. Byzantium had always been a great mart, and as soon as it became the metropolis of the Roman Empire there was naturally a much greater affluence of people ; it almost touched Asia, and from

* *Eusebii Hist. Eccles.* lib. x. ed. G. Reading. *Cantab.* 1720. Fo. p. 473. The extracts given are from *An Ecclesiastical History to the Year 324 of the Christian Era*, &c., by Eusebius, surnamed Pamphilus, Bishop of Cæsarea. Translated by Rev. C. F. Cruse, M.A. 8vo. Lond. 1838. Pp. 386–88, 392–94.

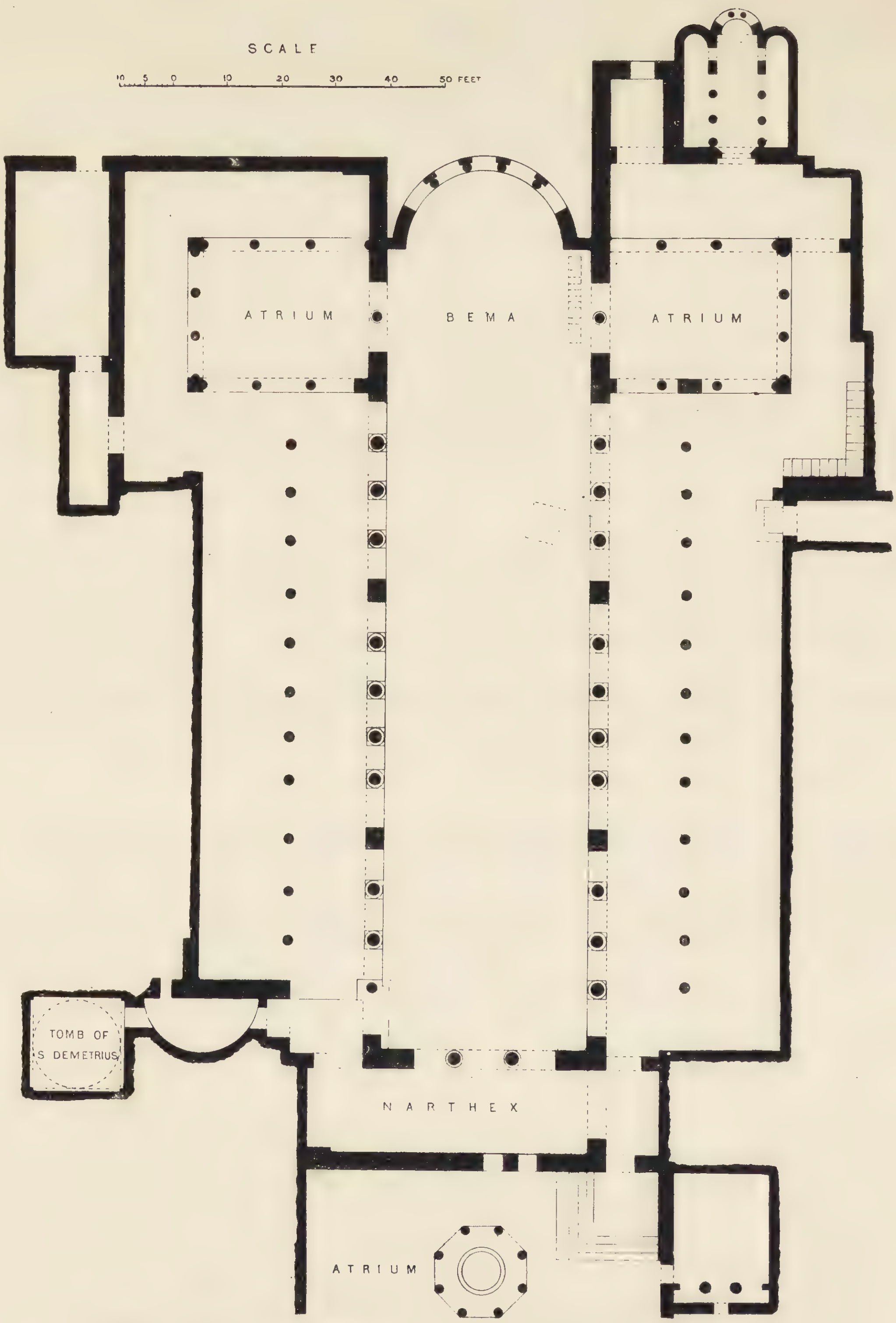

FIG. 44.—CHURCH OF ST. DEMETRIUS, SALONICA. (Scale of about 30 feet to one inch.)

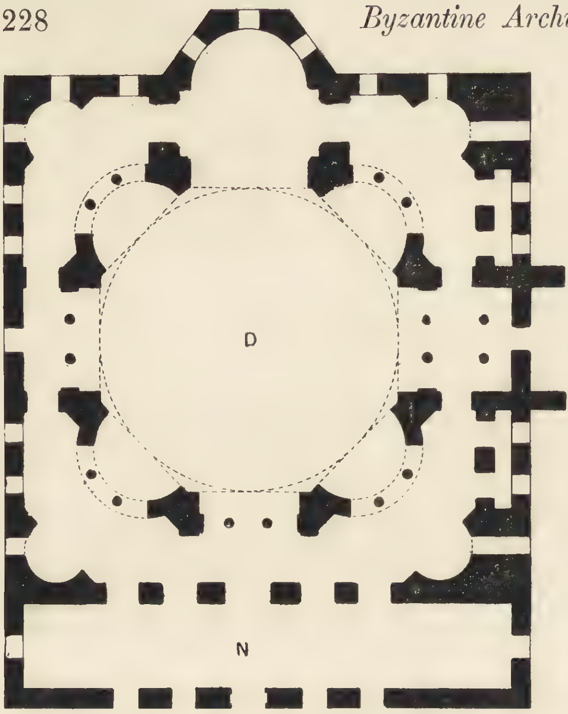

FIG. 45.—CHURCH OF ST. SERGIUS.
D, Dome. N, Narthex. (Scale of about 35 feet to one inch.)

FIG. 46.—CHURCH OF SAN VITALE, RAVENNA.
(Scale of about 44 feet to one inch.)

this and from Greek being spoken, it was likely to be more frequented by the nations of Asia Minor, the Syrians, Persians, and Egyptians, than Rome. It has been found by M. Dieulafoy and others that the ancient Persians used domes mostly egg-shaped over square chambers, the change from the square to the round being made by a sort of pendentive pierced by a squinch; and M. Choisy is of opinion that these domes on squinches, found at Serbistan and Firouzabad, were of the days of the Achæmenides.* This dynasty began to reign in the eighth century B.C., and was extinguished by the death of Darius in 330 B.C. There is, however, a pendentive not quite regular in form found at one of the octagonal halls of the enclosure at Caracalla's Baths (211 A.D.), first mentioned, I believe, by Ware in his tracts on vaults, in 1822, and afterwards by Texier and Pullan in their *Byzantine Architecture,* 1864.

It is curious that, so far as we know, this invention was not used again for more than 300 years, for it seems to be agreed on all hands that the first great dome on four pendentives in the Byzantine Empire was that of the great St. Sophia, or Holy Wisdom, built from the model of Anthemius of Tralles, by himself and Isidorus of Miletus.

Before the great St. Sophia, the little St. Sophia, a church dedi-

* Consult, in TRANSACTIONS, Vol. VII. N.S., pp. 37–61, the Paper by Mr. R. Phené Spiers, F.S.A., on "Sassanian Architecture," particularly figs. 7, 8, 9, 12, and 13.

cated to St. Sergius [fig. 45], was built with a dome, but without pendentives. There

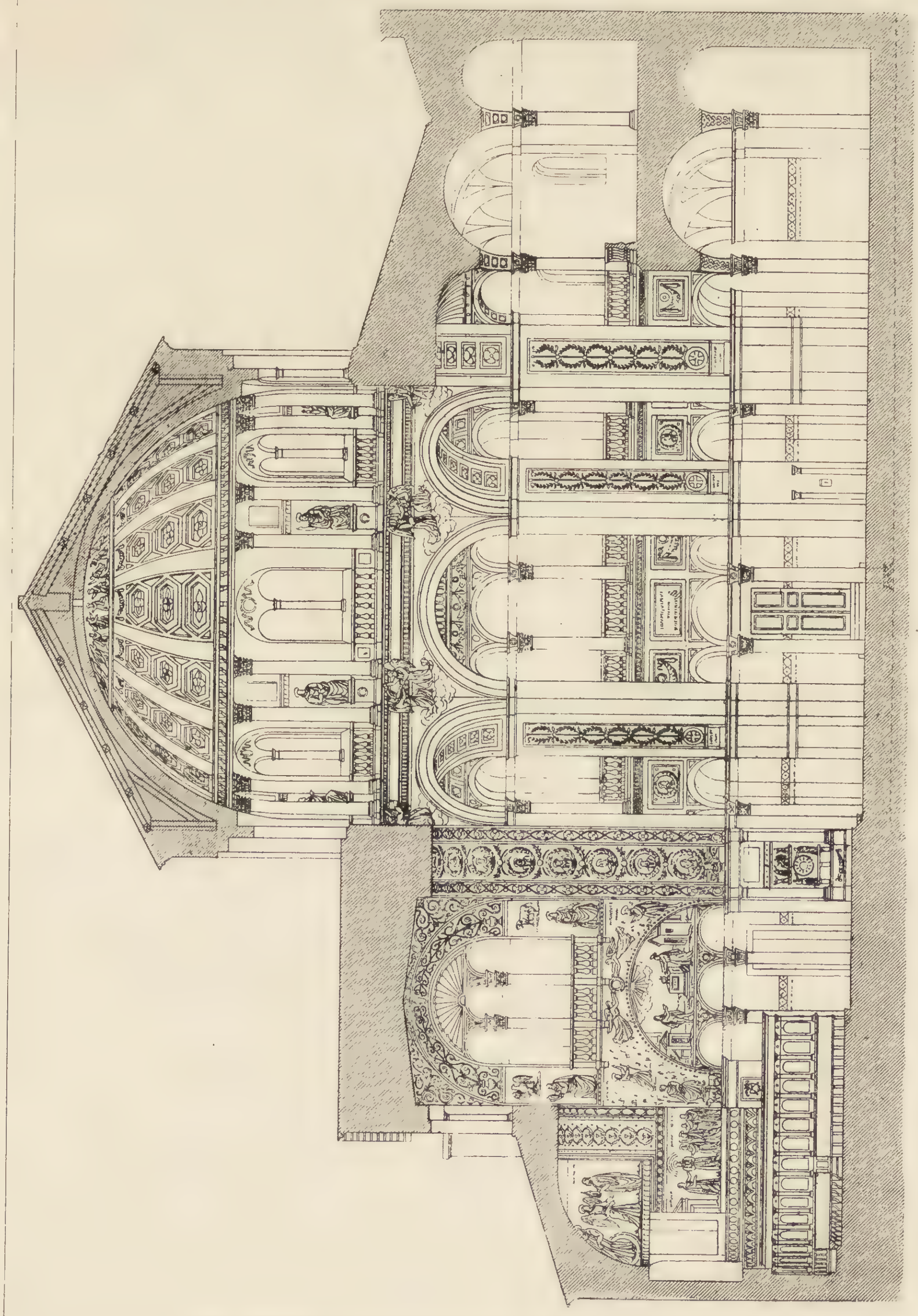

Fig. 47.—Church of San Vitale, Ravenna. Reduced from *Les Édifices Circulaires*, of Isabelle.
(Scale of about 22 feet to one inch, say twice that of fig. 46.)

were originally twin churches: one, which was basilica-shaped and timber-roofed, St.

Bacchus, is long since destroyed; the other, which has a fluted dome, St. Sergius, still remains. The church at San Vitale [figs. 46, 47, 48] is very like the latter internally,

Fig. 48.—Church of San Vitale, Ravenna. (Reduced from *Les Édifices Circulaires*, of Isabelle.)

only the dome is hemispherical and smooth, and has some little pendentives. It was a

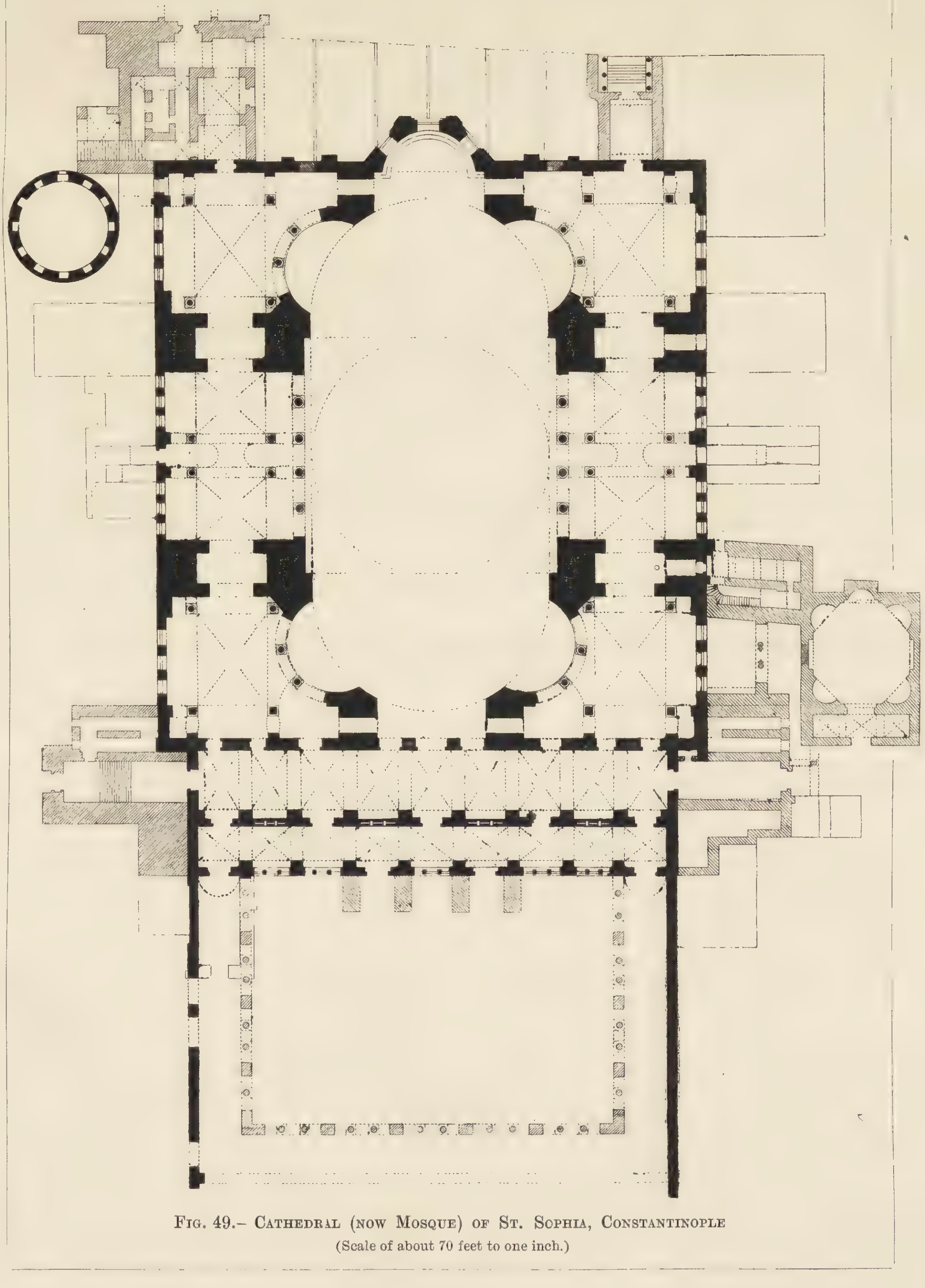

FIG. 49.– CATHEDRAL (NOW MOSQUE) OF ST. SOPHIA, CONSTANTINOPLE
(Scale of about 70 feet to one inch.)

very bold attempt of Anthemius to start a dome of over a hundred feet in diameter on four pendentives, and with the least rise of any large dome in the world. At St. Sophia the four main piers supporting the arches and pendentives, and parts of the half domes of the great apses and of the galleries, were built of large stones run with lead. Two earthquakes in Justinian's days caused parts of the dome to fall; and when the dome was eventually rebuilt by a nephew of Isidore twenty-eight feet higher, it is said, than the original dome, the arches of the aisles were so much crippled that they had to be strengthened with under-arches on piers about six feet square, which strangle the circulation of the aisles. Originally built as a basilica by Constantine, it was burnt down in 404, and rebuilt by Theodosius in 415; in the fifth year of Justinian's reign, it was again burnt in the riots of the Nika, on the Ides of January 532. In forty days the site was cleared; Anthemius's model was approved, and the cathedral completed in 538 [fig. 49]. Ten thousand men are said to have been employed; the cost, it is stated, being a million sterling. There is an account in Procopius's "Buildings of Justinian" of the accidents to the structure during its building, and an amusing description of the adroit flattery of the Emperor by the architects. Next to St. Sophia, the most important building, for its influence, was the Church of the Apostles, originally built by Constantine, rebuilt by Justinian, and eventually destroyed by Mahomet II. for his mosque; so all we know of it is from the description of Procopius;* but from it as a model, St. Mark's at Venice [fig. 50] and the Church of Saint-Front at Perigueux, in the eleventh century, are said to have been built. Like it, both had five domes; but that "jewelled casket," St. Mark's, was built of brick, veneered with marble and mosaic, while Saint-Front's is of cut stonework, left bare.

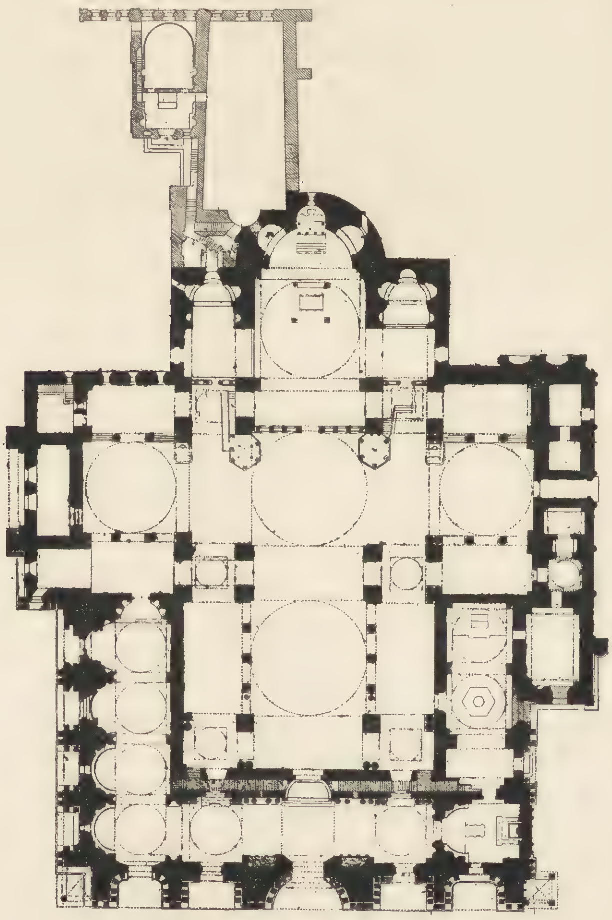

FIG. 50.—CATHEDRAL OF ST. MARK, VENICE.
(Scale of about 70 feet to one inch.)

* *Of the Buildings of Justinian by Procopius* (*circ.* 560 A.D.): translated by Aubrey Stewart, M.A., and annotated by Col. Sir C. W. Wilson, K.C.M.G., and Prof. Hayter Lewis. 8vo. Lond. 1886.

It is necessary to say something here of the buildings of Central Syria, described by the Marquis de Vogüé, as the earlier ones seem to have had considerable influence on Byzantine architecture, and the later were probably Byzantine. The Prætorium at Mousmieh was built between 160 and 169 A.D., in the days of Marcus Aurelius and Lucius Verus, and consists of a square building, with a portico in front. The build-

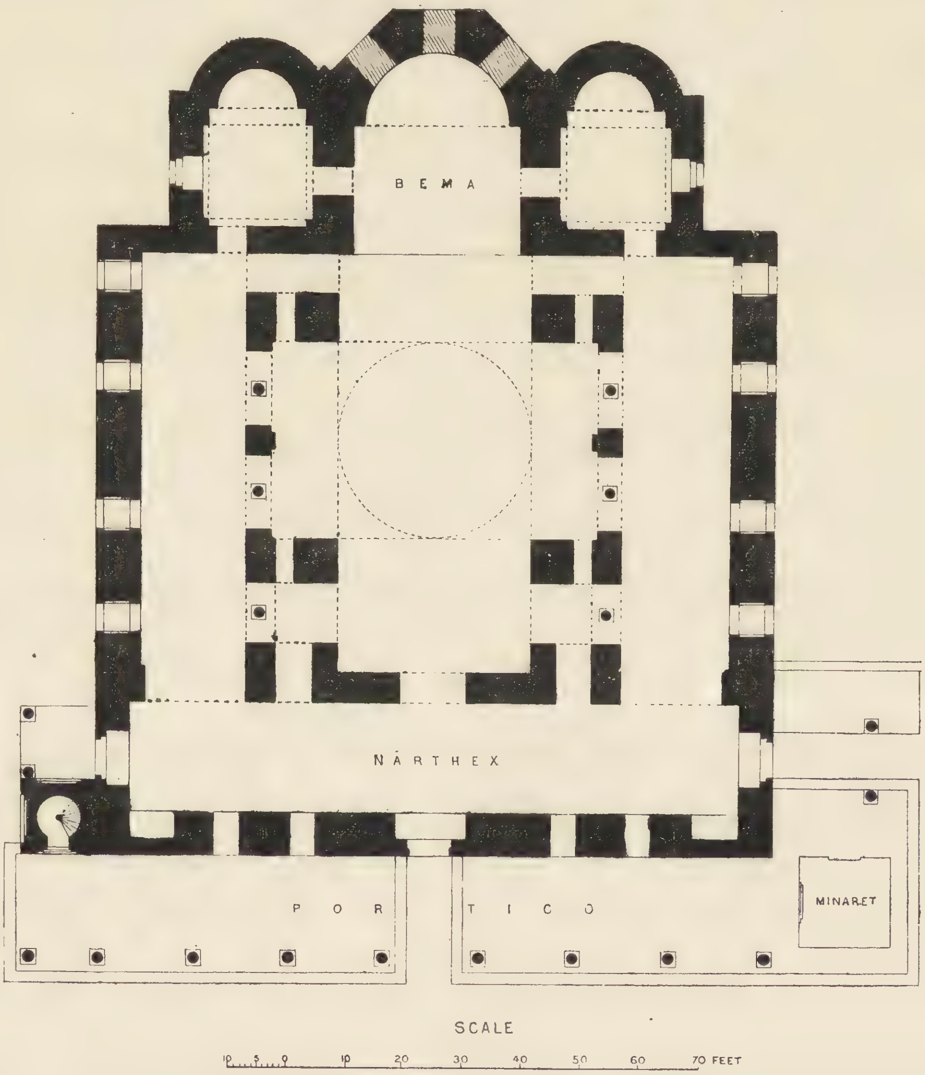

FIG. 51.—CHURCH OF ST. SOPHIA, SALONICA. (Scale of about 35 feet to one inch.)

ing is divided into a nave and two aisles vaulted on sixteen columns, the centre part of the nave having a larger groined vault at a higher level. There is an apse at the end of the nave, and two square chambers on either side of it. I fear there is not much certainty about the dates given of the other Syrian basilicas, churches, chapels and baptisteries, &c.; but most of the basilicas and churches have a semicircular or curved apse to the nave, except the church at Behioh, which has a square one. The churches

of Baqouza, Qalb-Louzé, Roueiha, Behioh, Tourmanin, and the baptistery of St. George of Ezra, have the two square chambers on either side of the apse or recess. Most of these churches are roofed with timber, but the basilica of Tafkha is roofed with stone slabs on arches, and the centre of St. George of Ezra is domed from an octagon, on corbelling.

We must bear in mind that after the building of the great St. Sophia the constructive problem to be solved was the making domes on pendentives safe. The original dome of St. Sophia fell twice, and was then rebuilt with a higher rise; but that did not wholly remove its insecurity, as constant additions had to be made to the abutments to prevent failure, even up to the middle of the fifteenth century, if not later. The weakness of the abutments to the dome and pendentives was mainly on the north and south sides, though the arches there are nineteen feet wide, and their ends are buttressed by high and massive towers; we do, however, find in minor and later examples that barrel-vaults take the place of the arches; the east and west pendentives are amply abutted by the semidomes of the great apses. We look in vain for another big dome in Byzantine work, and we can only find its compeers in Ottoman work.

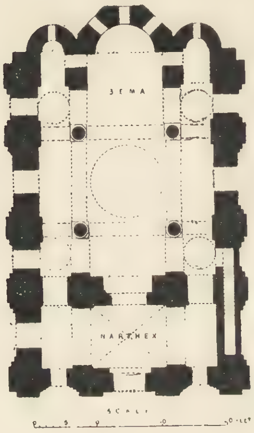

FIG. 52.—CHURCH OF ST. BARDIAS (SO CALLED), SALONICA.

(About 30 feet to one inch.)

M. Choisy has pointed out that the dome of St. Sophia at Salonica [fig. 51] is abutted by vaults a third of the diameter of the dome, without counting the walls of the side galleries; but this church has other characteristics of a later date—viz. three apses at the east and a drum to the dome. At some period the Orthodox Church dedicated each aisle to a different saint, so that each church, speaking materially, was dedicated to three saints, and each aisle then required its apse at the east end. Professor Cattaneo* says that in the West these three apses never occur before the end of the eighth century, and became general in the ninth; so that if their adoption in the West was coeval with their introduction in the East, St. Sophia of Salonica was at least two centuries later than its prototype. St. Irene at Constantinople was built by Constantine, and was probably basilica-shaped and roofed with wood. It was burnt down in the riots of the Nika, and rebuilt, according to Procopius, by Justinian; and if there were no other peculiarity about it we should not be surprised at its having square ends to the aisles, but it is supposed to be the first church that had a dome on a drum; a feature that marked the Neo-Byzantine period. However, Ducange tells us it was much damaged by an earthquake in the reign of Leo the Isaurian, 717–741, so it is quite possible that the central dome was destroyed and rebuilt on a drum, in or after Leo's reign. The church to the Virgin as the Mother of God at Salonica, called by Texier and Pullan St. Bardias [fig. 52], has been looked on as an early specimen of a dome on a drum; but here we have the date of its dedication, A.M. 6537. This was reckoned from the year of the world, which according to the Byzantine authorities was 5508 B.C., consequently the dedication

* *L'Architecture en Italie du VIe au XIe siècle : recherches historiques et critiques.* By Prof. R. Cattaneo, translated from the Italian by M. Le Monnier. 4o. Venice, 1890.—G. A. (In the Library.)

of the church was 1029 A.D., and, according to Finlay, in the reign of Constantine VIII., who died in November of the same year. I may here mention that the elevation and section of this church (St. Bardias), as given in Texier and Pullan, must have been drawn from memory, as they are unlike the church. The arrangement, too, points to a late date; the plan shows the three apses at the east end, and a large central dome supported on columns and surrounded by four small domes.

In this dull Paper I cannot refrain from giving you an account of the humorous creation by Texier and Pullan of the imaginary St. Bardias. Pullan had been a Grecian at the Bluecoat School, and doubtless Texier was a Greek scholar; but they were both scholars of the classical language, and quite innocent of the Greek spoken at the imperial court of Byzantium. They found the dedicatory inscription on the church, and translated it as follows:—"This place, formerly profane, was converted into a "magnificent temple of the Mother of God by Christofero, the treasurer of the "celebrated Basilicus, first sword-bearer, under the dedication of St. Bardias and of "his wife, and of their children Nicephorus, Anne, and was dedicated in the month of "September of the twelfth indiction, the year 6537."

The real translation of the passage in question is as follows:—"By Christopher, "general of the Imperial Brigade and captain of Lombardy." In Charlemagne's time all Italy was called Lombardy, and that part which still belonged to the Byzantine Empire was under a captain and was called a captaincy (*Katapanikion*), and the captain was called *Katapano*. Some portion of this captaincy still bears the name of Capitanata. Lombardy was called Longobardia in Greek (Λογγιβαρδια), but in court language it was called Λαγουβαρδια. In the inscription, from the *o* of *Katapano* being put under the L of Λαγουβαρδιας, it was read as ὁ Ἁγιος Βαρδιας, or St. Bardias; so you see Lombardy was not only converted into an orthodox saint, but was given a wife and family. Texier and Pullan candidly admitted that they could not find this saint in the calendar. The true reading of this inscription, which is due to Dr. A. Mordtmann of Constantinople, will be found in the *Revue Archéologique* of September 1878 [vol. 36, p. 172], to which my attention was called by the Rev. Mr. Crosbie of Salonica, the antiquary of the place.

A similar arrangement as to the five domes is found at St. Nicholas at Myra, which is nearly identical in plan with St. Theodore at Constantinople, called by Salzenberg and by Fergusson, Theotokos [fig. 54]; and two of the three churches of the Pantokrator [fig. 53], at the same place, are so treated, though one of these has piers.* In Greece the squinch or conch seems to have been preferred to the pendentive. We know very little about the dates of these Greek churches, but the cathedral at Athens is said by Professor Cattaneo to be of the eleventh century. It may be interesting to know that the Parthenon, the Erechtheum, and the Theseum were made into Byzantine churches, and dedicated respectively to St. Sophia and afterwards to the Virgin, to St. Nicholas, and to St. George; the vault of the last still exists. At the

* Santa Maria dell' Ammiraglio, at Palermo, now la Mortorana, has the same arrangement.—G. A.

Parthenon the marks of the apse may still be traced on the pavement at the east end, and remains of Byzantine frescoes still exist on the marble walls of the cella at

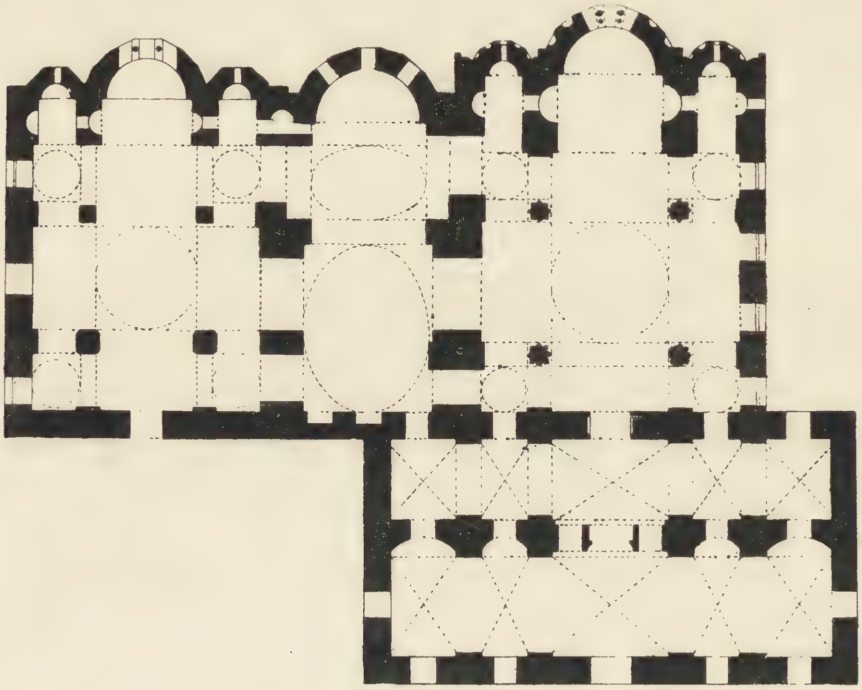

FIG. 53.—CHURCH OF THE PANTOKRATOR.
(Scale of about 35 feet to one inch.)

the west end. The last stage of Neo-Byzantine has a peculiarly hideous feature externally: the octagonal drums of the domes often have columns at the external angles, and are pierced with semicircular-headed windows; an octagonal arcade is thus formed on these drums, the arches of which, being concentric with the windows, become segmental and cut into the domes. Smaller domes also sprout up on drums in the later churches, and are used to convey light into what would otherwise be a gloomy narthex, which often runs round three sides of the church. The effect, pretty enough inside, may be seen in the Church of the Holy Apostles at Salonica, and in the Church of the Monastery-in-the-Fields (Μονὴ τῆς χώρας) at Constantinople [fig. 55]. This feature seems to have struck the Renaissance architects of Italy, for a similar arrangement is found at St. Mary-in-the-Fields at Piacenza. We may roughly say that most of the peculiarities in churches after the building of the great St. Sophia

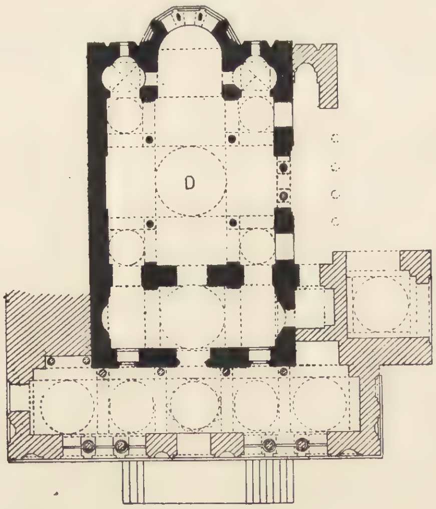

FIG. 54.—CHURCH OF THEOTOKOS (SO CALLED).
(Scale of about 35 feet to one inch.)

were structural ones, to prevent the spread of domes on pendentives, and the use of drums added to the weight. Eventually there was an inclination to support the dome on eight points instead of four, as at St. Nicodemus at Athens, at Daphne, and in the Ottoman mosque of Sultan Selim II., of Lepanto fame, at Adrianople.

It is not easy to describe all the æsthetic devices of early Byzantine work. The slips of entablature over the columns in the groined halls of the Roman Baths and the Basilica of Maxentius had impressed themselves on the memory of the architects, and were roughly imitated by a splayed or moulded block put over the capitals; the bearing part of this block on the capitals being often no bigger than the upper diameter of the columns, and rarely exceeding a fourth more. These blocks are universal up to a certain period, and may have been adopted in later work to eke out the requisite heights in old columns. We find them at Eski Djouma, St. Demetrius, St. Sophia, in the narthex of St. Elias, and in St. Bardias at Salonica, and apparently at the west porch of St. Sophia at Trebizond, at San Vitale at Ravenna [see fig. 48 *ante*], and in the Church of Cassaba in Lycia. It is also possible that the treatment of the arcade over the Porta Aurea at Diocletian's Palace was then and afterwards a common practice. Here the old entablature mitre-ing over each column was replaced by a square string-course capped with a moulding, and the rough form may have been retained for conservative reasons, but ultimately the device was structural. Heavy weights conveyed by piers as big or bigger than the abacus could not be placed safely on a Corinthian capital, while in the Ionic the abacus was too narrow for the mass. The architects remembered the Ionic capitals with a splayed block above them; and at St. Sergius, where the capitals are purely Byzantine, they carved the splayed block so as to form a capital, and made a sort of rough Ionic below it. At San Vitale, which was nearly contemporary with it, though the capitals are Byzantine, the blocks [see fig. 48 *ante*] are treated as a separate feature. At the great St. Sophia the main capitals have merely a deep abacus above the volutes of the cup-shaped capitals, which were probably imitated from the silver capitals Constantine put

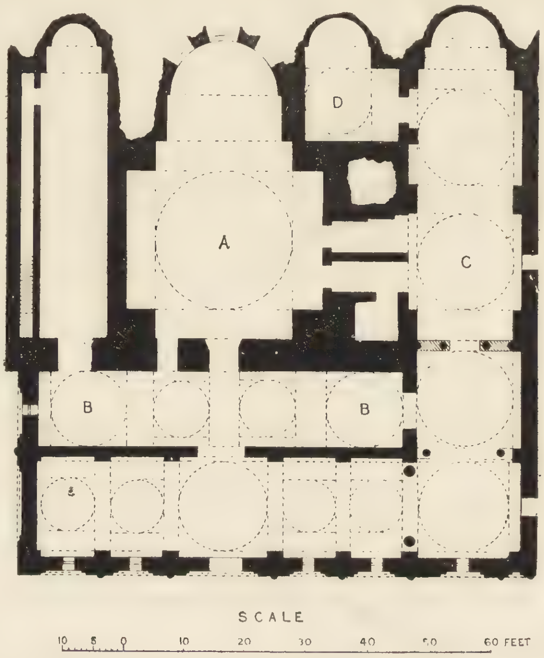

FIG. 55.—CHURCH OF THE μονὴ τῆς χώρας.*

Domes A, B, C, D project above the roof; domes B, B are fluted with 23 flutes; D has 8 rectangular ribs.

Scale of about 30 feet to one inch.

* The greater part of this church was measured by me, but the mollah in charge would not let me finish. I have never seen a complete plan of the building, but there is a partial one by Professor Lewis, F.S.A., in the Procopius mentioned on page 232 (footnote) *ante*.—G. A.

on the columns of his church at the Holy Sepulchre, for the treatment is purely metallic; the centres of the capitals bulge out so as to catch the light, just as a goldsmith would beat out a boss on a bowl of the precious metals. Eusebius, speaking of the Church of the Holy Sepulchre, says [cap. 38, "Life of Constantine"]: "The crowning "part of the whole was the hemisphere which rose to the summit of the church; this "was encircled by twelve columns (according to the number of the Apostles of our "Saviour), having their capitals embellished with silver bowls of great size." The capitals of some of the smaller columns of the galleries at St. Sophia are treated much like those of St. Sergius. These capitals had heavy loads to carry, and whether they were imitated from chased silver or the idea was original, the sculptor properly made the ornament mere surface-work, though there is at least one capital with a deep abacus, with doves under it at the angles, standing on basket-work, the part between the abacus and the basket being hollowed. Unconnected with the system of doming and vaulting, there are, as far as I have observed, few alterations made in the functional parts. Besides the cup-, cushion-shaped, or cubical capitals, perhaps the most noticeable thing is the turning the apophyges of the columns into deep bands; it was at the junction of the shaft with its capital and base, that failures were oftenest noticed at the great St. Sophia. Procopius speaks of the columns of the north and south arcades shedding "little scales as though they had been planed" [lib. 1, cap. 1]. Here a large proportion of the columns have bronze bands to the neckings and bases of the columns, keyed on, to prevent splitting or spalting, or to restrain further splitting.

The outsides of the buildings seemed mainly to have been left to take care of themselves—a tendency that was strongly marked in late Roman work—the whole attention being concentrated on the inside, although some fronts are ornamented with blind arches or open arcades. In late work some interest was given by the use of bricks in zigzags or rude imitation of the Greek fret; now, as then, late churches and other buildings are to be found, exhibiting some grace, elegance, and picturesqueness. I may say that the Byzantine architects had no skill in profiling; their profiles are poor, tame, and commonplace, with no proper æsthetic sequence in the mouldings, and look as if they had been done by a cheap marble mason to save material and labour. There is one curious device at the great St. Sophia, open to praise or blame as you please. Heavy internal cornices are not very logical, and the architect saw that, if looked at near, nothing was seen of the cornice but the cymatium and the soffits of the corona and modillions. He consequently made the cornice in the rough at an angle of forty-five degrees with the vertical, just hollowed out the splay for his cymatium, and made a slight recess for his modillions, and carved on the leaves of the cymatium and modillions; half the marble and much labour was thus saved.

Interiors were splendidly decorated after the Roman manner—that is, veneered with splendid marbles* often inlaid, surrounded by edges of what Mr. Ruskin calls the

* See in Transactions, Vol. III. N.S., the Paper by Mr. W. Brindley on "Marble: its Uses as suggested by 'the Past," and the "Addenda," by Dr. Edwin Freshfield, F.S.A., with the illustrations of wall-decoration in plates xxi, xxii, and xxiii.

"Venetian dog-tooth." Mosaic pavements were used, opus Alexandrinum being the most favoured, and the vaults and domes and often the upper parts of the walls were covered with glass mosaic, mostly on a gold ground ; but instead of the faultless forms of gods and goddesses, heroes and nymphs, there were "grisly saints and martyrs hairy," with an ample supply of symbols. When mosaic could not be afforded, frescoes took its place. in some of the churches believed to be of late date there are beautiful crowning members to doors, recesses, and panels, sculptured with the Greek acanthus and often pierced through. Admirable examples of this are to be seen in St. Theodore and the Church of the Monastery-in-the-Fields at Constantinople [figs. 54, 55].

From the accounts of Constantine Porphyrogenitus (Constantine VII.), the Imperial palaces were as curious in construction as they were splendid in internal decoration. These palaces, begun by Constantine and continued by his successors, are gone ; but by the industry and intelligence of Labarte some notion of their forms may be got, derived mainly from the descriptions of Paul the Silentiary and Constantine VII. The Imperial Palace of Byzantium consisted of at least five separate buildings divided by open spaces ; the Chalce and the grand Triclinium of Magnaurus are both said to have been built by Constantine, and wholly or partly rebuilt by Justinian after their burning in the riots of the Nika. To the south of the Chalce was the Palace of Daphne ; to the east was the Sacred Palace, with its courtyard, called the Phiale ; and then came the Sigma, the Triconque, and the grand throne-room, called the Golden Hall. A cathedral, called the new Basilica, churches, oratories, and small palaces, were dotted about its grounds. Among these last, close to the Bosphorus and nearly south on the meridian of St. Sophia, was the Porphyry Palace, lined and paved wholly with porphyry ; it was built by Constantine to receive the empresses at their confinement, and the princes born there are called Porphyrogeniti.

As the Byzantine Empire shrunk away, owing to the conquests of the Saracens and other barbarians, and to the natives becoming more effete, the situation of the Imperial palaces was found to be too much exposed to a sudden attack from the Bosphorus ; so the Emperors built another palace at Blachernæ, on the Golden Horn. Some ruins, now called the Palace of Belisarius, are believed by antiquaries to be a part of this palace. The great tank, called the Cistern of Philoxenus, which M. Choisy believes to have been built in Constantine's time, is called by the Turks the Thousand and One Columns, and is now dry, partly filled up, and used for spinning silk. It is interesting as showing us how the Byzantines built for pure utility. The columns are in two heights, the earth being now within a few feet of the junction ; they are of stone against the bed, the lower ones having no capital, but being fitted into or against a ring of stone on its bed, so that in the case of either column splitting it might not split the other ; and at each end of each shaft are the deep bands instead of apophyges. The capitals to those of the upper tier are in one stone, square or oblong at the top and cushion-shaped, worked down to a wide circular fillet at the bottom, which projects over the shaft. Semicircular arches span the space both ways, and over these are domes with the pendentives of the same radius ; in the brickwork

above the capitals are the holes where the wooden ties originally went across both ways.

All the peculiarities of Byzantine workmanship and construction, which are profoundly original and interesting, as well as the devices for abutting domes and vaults and for resisting the shocks of earthquakes, will be found in one of M. Choisy's great works, *L'Art de Bâtir chez les Byzantins.* Mr. Tarn was kind enough to calculate for me the thrusts of the domes at the great St. Sophia [pp. 247–50], and is, I hear, about to publish a new treatise on domes.

As the interior of the Pantheon at Rome strikes one as the most sublime building, the exterior of the Parthenon as the most perfect, the exteriors of some of the French cathedrals as the most wonderful, the interior of St. Mark's as the most gorgeous, so the interior of St. Sophia [fig. 56] strikes one as the vastest building one has seen. This effect is greatly aided by having to go down a long flight of steps and into the narrow narthex, which is but about thirty feet wide and forty-three feet high, though it is two hundred feet long, and as you naturally choose to enter by the Imperial door you have to go one hundred feet down this narrow gallery. From this door one step takes you into the main edifice, and you are astounded by its vastness. Now it is a mosque, and the ikonostasis has been removed, there is nothing to obstruct the eye between the Imperial doorway and the end of the apse, some two hundred and seventy feet distant, and you see a vast oblong hall more than a hundred feet wide, absolutely clear with the exception of the Turkish tribune (Dikka). The whole of this central part of the edifice is brilliantly lighted; the source of light is at first hardly perceived, much light coming from behind the aisles and much from a high level. After the first glance you naturally cast your eyes upwards, and from the door coming into the recess of the west apse, and the great dome springing at once from the great arches, you see half the central dome, which seems to float, or, as Milton says, to be "pendent by subtle magic." But you get no notion of the height until you reach the galleries; the eye is there some fifty feet from the pavement, so that the chandeliers appear to touch the floor; yet you seem no nearer to the dome. If we analyse the open space, we find it a double square, with some extra bits of the subsidiary apses. The total height from the pavement to the crown of the dome is about one hundred and eighty-five feet, or about one and three-quarter times the width between the piers; the dome itself being a little less than a hemisphere. From the pavements to the top of the cornice of the dome is about one and a third of its width; to the impost of the great semicircular arches it is nearly three-quarters of the width, and the arches themselves are slightly stilted.

The lighting, a thing little thought of in modern buildings, is thus effected. To begin at the top, there are forty windows round the base of the dome. In the north and south clear storeys there are windows in two tiers; the upper tier consists of a triplet 27 ft. 10 in. wide and 17 ft. high to the crown, and two windows at each end 10 ft. 10 in. by 6 ft. 8 in.; the seven lower windows are 6 ft. 5 in. by 9 ft. 3 in. to the crown. At the west end there is a semicircular window of about forty-six feet diameter, six feet of the

bottom being cut off by the roof of the gallery. There are five small windows in each of the zones of the great apses—five in each of the semidomes of the subsidiary apses,

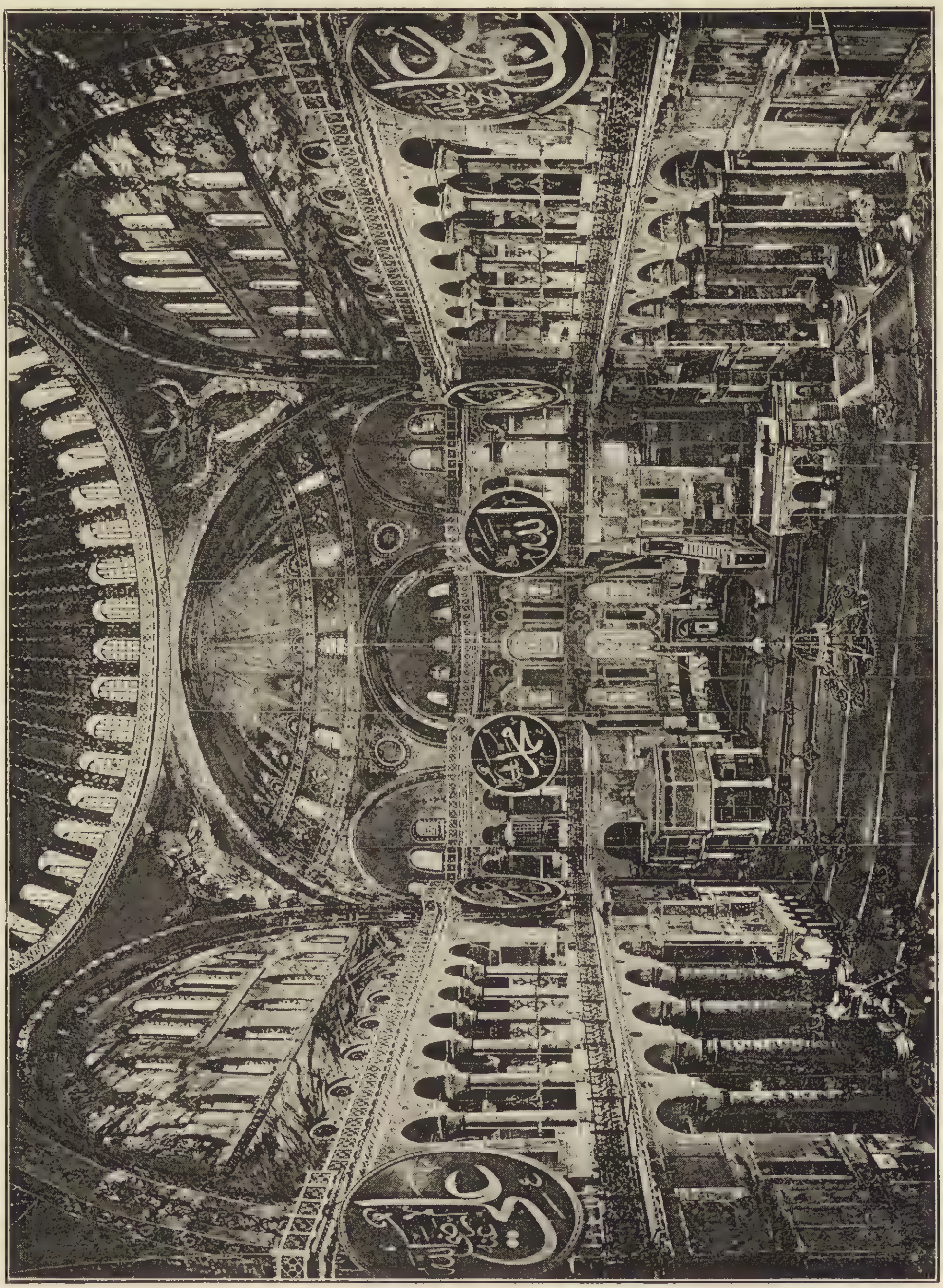

Fig. 56.—St. Sophia, Constantinople.

five in the semidome of the apse of the sanctuary, and a double tier of three windows in the apse itself. Justinian unfortunately dreamt that three windows should be made in

Fig. 57.—St. Sophia, Constantinople.

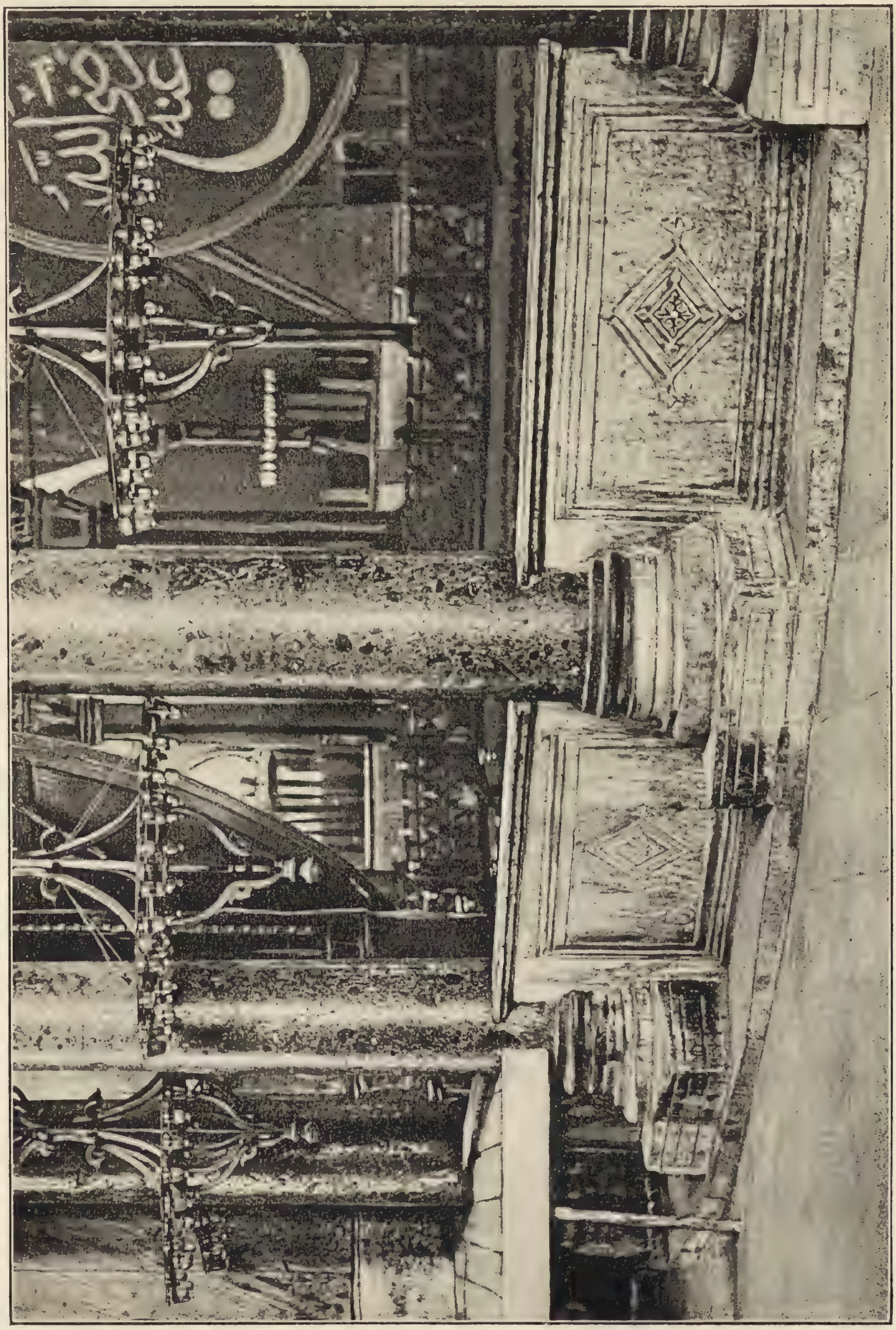

FIG. 58.—ST. SOPHIA, CONSTANTINOPLE.

this apse. The aisles on both floors are flooded with light, as nearly all the north and south walls between the piers are windows. The east end of each aisle is lighted by two vast triplet windows, and there are two smaller windows between them and the bema. Some of the effects produced on the beholder are doubtless due to the unusual shapes, such as the vast zones of the great apses, and to the shape of the subsidiary two-storeyed apses or exedræ.

The colour decoration is also splendid. The walls to the upper cornice are panelled with lovely and precious marbles, while some of the most beautiful and effective inlaid work that can be imagined is lavished on the spandrels of the upper arcades and the friezes running from them. This inlaid work is of black and white marble interspersed with spots of colour. The superb monolithic columns of verde antique and porphyry, with their white marble capitals and bronze bands, greatly add to the richness of colour and dignity of the effect; while the profusion of carving impresses one with the idea that no grudging hand was employed in rendering that sublime monument a worthy offering of gratitude to the Creator. The whole of the upper part blazes with glass mosaic in patterns on a gold ground: the figure subjects have been gilded over by the Turks. Though the effect would be improved by repolishing the marble, for the gold mosaic overpowers the lower part, still the whole effect is that of subdued splendour.*

Having now finished my sketch of Byzantine architecture, I will say a few words on the peculiar character of our age and the wants of our art.

This age is a marvellous one, perhaps the most marvellous the world has seen. Wondrous conquests have been made over time and space; not only the words, but the very voices of the dead have been preserved for us; the elements in many instances have become our slaves; space is compelled to afford us artificial light; the sun is our humble perspective draughtsman, who does not even ask for his labours food, clothing, or shelter. The imaginings of poets and romancers have been surpassed:

> I'll put a girdle round about the earth
> In forty minutes

is done daily by the thousand. The steam-engine fills the place of millions of workers, and operations are done by machinery that rival the skill of the deftest fingers. In fact, we see that the discoveries and inventions of the last century and a half have as completely separated us from the old world, as the Flood separated that from the antediluvian world. The interest in the old world is fast dying out; classical lore is being abandoned, and the sciences of yesterday are taking its place.

The engineers have been enabled by modern physics and mathematics to carry the art of construction in iron to marvellous perfection; they have probably surpassed the mediæval architects in constructive skill. We cannot believe that all these wonders have no effect on the imagination, nor that Englishmen will never desire to celebrate

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* Judging from the Introduction to his Second Book I imagine that Theophilus alludes to stained glass at St. Sophia.—G. A.

their triumphs over matter, and their vast wealth, by domed or vaulted monuments that will charm the present age, and tell posterity of our place in civilisation. Art not only instructs the uneducated and is the most faithful mirror of civilisation, but supplies a phase, perhaps the most interesting, of that beauty which Nature gives us for our elevation and delight. Let us see what the architects can now do for this consummation, in what they are lacking, and where the public fails.

Architecture has in some respects made great strides, and the architects are bestirring themselves to make greater. London is fast becoming a pleasant-looking city. The art of sketching architecture is not only widely spread, but has arrived in my time at marvellous excellence, and though it is not an architectural art, but the art of the illustrator or scene-painter, yet it does have some effect on the work produced. Vilars de Honecort was not a good perspective or figure draughtsman, but he could, and did, build original cathedrals. The younger men, however, are beginning to study geometry and lines, called by Mathurin Jousse "the secret of architecture," and the acquisition of this knowledge cannot fail of future effect.

What seems to be overlooked is that architecture is a structural art, and that all that architects can tell is by building, and yet very few seem to thoroughly acquire the art of construction. With the exception of Greek and Saracenic architecture, of which the first was a purely æsthetic improvement, and the latter was mainly distinguished by its ornament, architecture has had for one of its main aims the solution of constructive problems. I know that if engineers can build iron bridges of 1,300 feet span, to bear the stress of storms, and to safely carry heavy engines with trains of waggons filled with earth, stone, or metal, they can supply architects with ironwork to carry spans of 150 feet to 200 feet with light loads; but then, if we are to remain architects and give up construction, we must develop some appropriate æsthetic advancement. Yet we seem no nearer an æsthetic agreement, not to speak of development, than to constructive knowledge. Artistic invention may not be the present gift of Christendom, but we can at least learn the laws of arrangement, expression, and composition; and there are many who could attain a knowledge of construction, for we, like the Romans, are a constructive race. We have almost to re-create architecture, since the main current was stopped in the fifteenth century, to make it express our advances in knowledge, taste, and ideas. In Italy, which was once the centre of the arts, architecture fell into the hands of scholars, antiquaries, goldsmiths, sculptors, and painters, who were quite innocent of the first elements of construction and of architecture, but who tried to pick up some knowledge of them from the Roman ruins. The last Roman monuments were built a thousand years before. If modern doctors were to ignore all that has been learnt since the time of Hippocrates, or the engineers since the building of the Tower of Babel, they would imitate the procedure of the Renaissance artists.

We admire the genius of the sculptor Brunellesco, who by the mere force of intellect, and what he picked up at the Roman ruins, was enabled to build the great dome at Florence, the largest dome of masonry built since that of the Pantheon at Rome; but we cannot help deploring the waste of his valuable time and of the costly

material. He absolutely ignored all the advances in construction between the Baths of Constantine (312 to 337) and 1407—all the triumphs of domed and vaulted construction; but, not to speak of anything but domes, St. Sophia had been constructed on pendentives nearly nine hundred years before, and he must at least have heard of it. Probably dome-building was going on at Constantinople in his days; at any rate, there was skill enough there in 1469 to build the domed mosque of Mohamed II., who took Constantinople nine years after Brunellesco's death (1444). Architecture has consequently ceased to be a progressive art in Christendom ever since. Yet we, who

> Rift the hills, and roll the waters, flash the lightnings, weigh the sun,

must have something more to express in our art than the Greeks, Romans, Byzantines, Saracens, or Mediævals. As a nation we certainly cannot pose, like the Greeks, as lovers of the beautiful; but we are not so far removed from the Romans in character that we need despair of producing in our monuments the grand and the dignified.

There are, however, two essential conditions to the production of noble architecture. An effective desire for grand and permanent structures to embody the high aspirations of the people—aspirations that cannot be gratified by the erection of one building, but only by a succession of buildings to the same end throughout the country; and that almost superhuman skill, knowledge, invention, and, withal, that enthusiasm, which go to make a great architect. Nothing that we know of has been perfected at the first essay. Success has only been achieved by the long and continuous striving of many for generations. If we can adduce an exception to this law, we may be sure it is because we are unacquainted with the facts. In Roman times almost every educated nobleman wrote verses, and had certainly studied the poetical masterpieces of Greece, so there was a large body of persons who could critically judge of superior merit hence we have Virgil, Horace, Ovid, Catullus, Martial, and Juvenal. In Dante's days there was a galaxy of poets, and of playwrights in Shakespeare's; Raphael and Titian came, after painting had revived for more than two hundred years, when every blank space in churches and public buildings had been covered by paintings, and when great painters were looked on as divinely inspired; there were many hundred years of cathedral building before Gothic emerged, and it took some time before the masterpieces of that style were created; there was then an ardent desire to possess masterpieces; and the clergy at least were educated critics, for though they had long practised architecture, they admitted the superiority of the lay architects. How, then, can we look for noble architecture while there is no passionate desire for it in the people, and no opportunity of acquiring perfection, by the building of a long series of monuments, to the noblest and loftiest ideal?

George Aitchison.

THE DOME OF ST. SOPHIA, CONSTANTINOPLE.

[Note by Mr. E. Wyndham Tarn, M.A.]

The dome *appears* to be nearly a hemisphere, with an internal radius of 55 ft., but *constructionally* it is a segmental dome, beginning at EF, the radius OE making an angle of 60° with the vertical OA, O being the centre of curvature. The part from E to D is thickened out so as to form an abutment, the inner surface only being worked to the curve of the dome [fig. 59*a*.]

Taking the 180th part of the circumference, we have P = weight of the "lune" ABEF subtending an angle of 2°, or 180th of the dome;

δ = weight of a cubic foot of material;

N for the thrust of the opposite "lune" at A;

G the centre of gravity of P;

θ, the angle BOE;

R the outer radius of the dome, OA, or OF;

r the inner radius of the dome, OB, or OE.

We find N from the equation

$$N = P\frac{Ep}{Am}.$$

$$P = \cdot 01163\,(1 - \cos\theta)\,(R^3 - r^3)\delta.$$

$$Ep = r\sin\theta - \frac{3}{8}\,\frac{\theta - \frac{1}{2}\sin 2\theta}{1 - \cos\theta}\,\frac{R^4 - r^4}{R^3 - r^3}.$$

$$Am = R - r\cos\theta.$$

In this case $\theta = 60° = 1\cdot 047$ in "circular" measure, $\sin\theta = \cdot 866$, $\cos\theta = \cdot 5$, $\sin 2\theta = \cdot 866$, $1 - \cos\theta = \cdot 5$, $R = 57$, $r = 55$.

$$P = 109\cdot 27\delta,\ Ep = 13\cdot 24,\ Am = 29\cdot 5.$$

$$N = \frac{109\cdot 27 \times 13\cdot 24}{29\cdot 5}\delta = 49\delta.$$

= thrust of 180th of dome at EF.

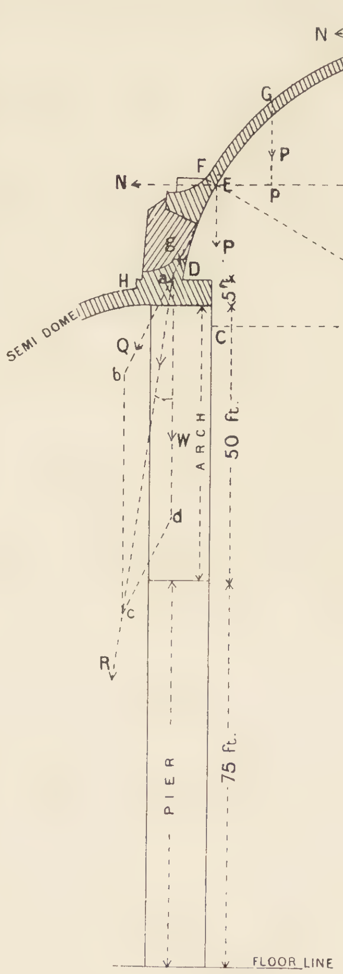

Fig. 59*a*.

Putting $\delta = 1$ cwt., we have $P = 5\frac{1}{2}$ tons, and the thrust of 180th part of the dome at the joint EF amounts to 49 cwt., or nearly $2\frac{1}{2}$ tons. The total thrust of the dome is $180 \times 2\frac{1}{2}$ or 450 tons.

The radius Em is 46 ft., so that the circumference is 289 ft. at the level of the joint EF, and the thrust of the dome at the level of EF is $\frac{450}{289} = 1\cdot 56$ tons per foot-length of circumference.

If a ring or belt of iron is placed round the dome at F, and T is the total normal pressure on the ring at that level, we have

$$T = 180 \times N = 450 \text{ tons.}$$

And, according to Rankine, the tensile stress in the belt is ·16T = 72 tons, and at 5 tons per sq. in. of section the iron belt should have a sectional area of 14·4 sq. in.

Now as to the resistance offered by the substructure to the thrust of the dome, which is circular on plan, and covers a square chamber, by means of pendentives at the four angles. The weakest points for resisting thrust are evidently at the middle of each of the sides. Two of the sides can hardly be called sides, as the opening is 100 ft. wide spanned by a semicircular arch, the summit of which is 125 ft. from the floor. The thrust is resisted by half-domes, which act as flying-buttresses and carry it to the outer wall of the semi-domes. The lower part of the dome from F to D is about 8 ft. thick, and pierced with small windows all round; this wall will carry the thrust from F to the semi-dome at H. This appears to be a very hazardous way of counteracting the thrust, and it is difficult to believe that it would be efficient without some sort of belting round the dome itself, at or below F.

The thrust of the dome is much more efficiently resisted on the other two sides, where there are heavy piers 18 ft. × 25 ft., and nearly solid; these carry an arch having an opening 70 ft. wide. The entire weight of the dome and the arches is carried upon four piers of the dimensions given above (18 ft. × 25 ft.), for which purpose they are no doubt strong enough, if built of solid material.

The weight W of the portion of the base of the dome FH, corresponding to 180th of the circumference, may be roughly estimated at 12½ tons, acting vertically through its centre of gravity *g*.

Let E*a* be the direction of the resultant, Q, of P and N acting at E, and intersecting the vertical through *g* in the point *a*. Produce E*a* to *b*, taking *ab* to represent Q, and let *ad* represent W on the same scale that *ab* represents Q. Complete the parallelogram *abcd*, and the diagonal *ac* will represent the resultant R both in direction and magnitude, making an angle of about 8° with the vertical, and amounting to about 18 tons for the 180th part of the dome. The horizontal thrust at the point *a* will be the resolved part of R, and is about 2½ tons; this is the thrust that has to be counteracted by the pressure of the semi-dome.

Thrust of Semi-Domes.

The thrust of a semi-dome upon the outer walls from which it springs can be calculated by the formulæ for the entire dome, and the strength of the abutment can also be determined in the same way.

Suppose the dome to be divided into a number of "lunes" as ABCD cut out of the dome by planes passing through the axis OA, two adjacent planes making the small angle of (say) 2° with each other [fig. 59*b*].

Let OEF make an angle of 70° with the vertical, EF being the joint of rupture; N, the horizontal thrust at A; P, the weight of the part of the "lune" ABEF, having G

for its centre of gravity; F, the weight of the part of the "lune" EFCD; Q, that of the portion of pier or wall supporting the "lune;" R the external, and r the internal, radius. A vertical Gp from G meets the horizontal Em in p.

Let δ be the weight of a cubic foot of material. Then we find—

$$P = \cdot007656\ (R^3 - r^3)\delta$$

$$mp = \frac{3}{8}\ \frac{\cdot90032}{\cdot65798}\ \frac{R^4 - r^4}{R^3 - r^3} = \cdot5131\ \frac{R^4 - r^4}{R^3 - r^3}.$$

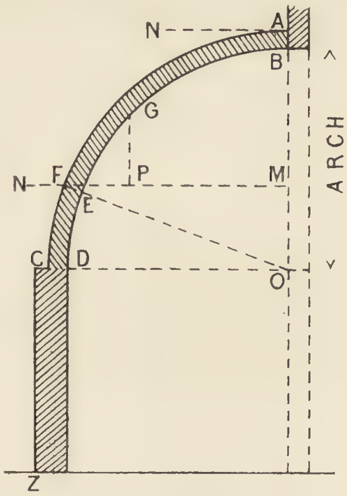

FIG. 59*b*.

When R $-\, r$ is small as compared with r, we can put $\frac{R^4 - r^4}{R^3 - r^3} = \frac{4}{3}r$, very nearly, in which case $mp = \cdot6841r$, and $Ep = \cdot93969r - \cdot6841r = \cdot2556r$

$$Am = R - \cdot34202r$$

$$N = P\,\frac{Ep}{Am} = \cdot00196 \times \frac{R^3 - r^3}{R - \cdot34202r} \times r.\ \delta.$$

The thrust of the whole semi-dome is found by multiplying this value of N by 90. Take the case of the exedra to St. Sophia, where $r = 50$ ft., and suppose $R = 52$ ft., or $R - r = 2$ ft. Then we have

$$N = \frac{\cdot00196 \times 15608 \times 50}{35}\,\delta = 4\cdot37\,\delta.$$

If $\delta = 1$ cwt. then $N = 2\cdot185$ tons, and the total horizontal thrust at the level of EF is $90 \times N = 196\cdot65$ tons.

To find the requisite thickness t of the wall to sustain this thrust with *safety*, we have to equate *twice* the moment of N taken about Z, the outer edge of the wall, with the moments of P, F, and Q about Z.

Let h = height of wall = 75 ft. in this case.

$$F = \cdot00398\ (R^3 - r^3)\,\delta = 62\cdot12\,\delta, \text{ when } R = 52,\ r = 50;$$

and the moment of F is

$$F\left(t + r - \cdot7351\,\frac{R^4 - r^4}{R^3 - r^3}\right) = F\left(t + r - \cdot7351 \times \frac{4}{3}r\right)$$
$$= F\,(t + \cdot02\,r)$$
$$= 62\cdot12\,(t + 1)\,\delta = (62\cdot12\,t + 62\cdot12)\,\delta.$$

The moment of P is

$$P\,(t + \cdot0603\,r) = 119\cdot5\,(t + \cdot0603\,r) = (119\cdot5\,t + 360\cdot3)\,\delta.$$

The moment of Q is

$$\cdot00582\,(3rt^2 + t^3)\,h = (65\cdot5t^2 + \cdot4365t^3)\,\delta.$$

The moment of N is

$$43\cdot7\,(75 + 17\cdot1)\,\delta = 4024\cdot77\,\delta.$$

If we suppose the whole structure to be built of similar materials we can omit the value of δ from our calculations.

Multiplying the moment of N by 2 for *stability*, we have for the equation from which to determine t—

$$8049{\cdot}54 = {\cdot}4365t^3 + 65{\cdot}5t^2 + 181{\cdot}62t + 422{\cdot}42$$

which reduces to

$$t^3 + 150t^2 + 416t - 17473 = 0$$

a solution of which is very nearly $t = 9$ ft.

We have now to consider the thrust of the semi-dome against the crown of arch OA [fig. 59*b*].

The value of N (43·7 δ) found above will be the pressure exerted by each "lune" of the dome at the apex, but acting at an angle to the plane of OA, according to the position of the "lune" in the dome. Therefore, to obtain the pressure R at right angles to the plane of the arch, we must multiply N by the *sine* of the angle which the "lune" makes with that plane; or the pressure of each half of the semi-dome is

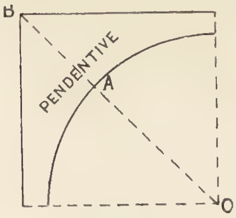

Fig. 59*c*.

$$N\,(\sin 1^\circ + \sin 3^\circ + \dots \sin 89^\circ)$$
$$= N \times 28{\cdot}64938 = \tfrac{1}{2}R.$$

And

$$R = 2 \times 43{\cdot}7 \times 28{\cdot}64938\,\delta = 2504\,\delta$$
$$= 125{\cdot}2 \text{ tons}$$

is the pressure at the apex at right angles to the plane of the arch.

This result shows that any outward pressure of the central dome of St. Sophia is completely resisted by the semi-dome of the exedra which abuts against the arch at the point where its resistance would be weakest.

The pendentives carry all the thrust both from the dome and the semi-domes down to the angle piers, and give great stability to that part of the structure, as the distance AB [fig. 59*c*] from the inner surface of the dome to the outer angle B of the square wall supporting it will be about 25 ft., giving a great moment of resistance.

E. Wyndham Tarn.

COMBINATIONS OF EQUILIBRIUM AT ST. SOPHIA AND IN BUILDINGS WHICH ORIGINATE FROM IT.

[Translated from *L'Art de Bâtir chez les Byzantins*, ch. xii., by M. Auguste Choisy.]

St. Sophia astonished its contemporaries less by the splendour of its mosaics and marbles than by the wonderful lightness of its structure; to them it appeared—to use their thoroughly Oriental form of admiration—that its dome was suspended in space by an invisible power, so slender were the supports that upheld it. I should like to analyse those means; and I propose to show what they were in the mind of the architect who conceived them, the defects which time has revealed in them, and, lastly, the improvements necessary to bring them by degrees to perfection.

A general view [fig. 63] and a plan taken above the aisles [fig. 60] show clearly the whole of the elements which contribute to the equilibrium of the building.

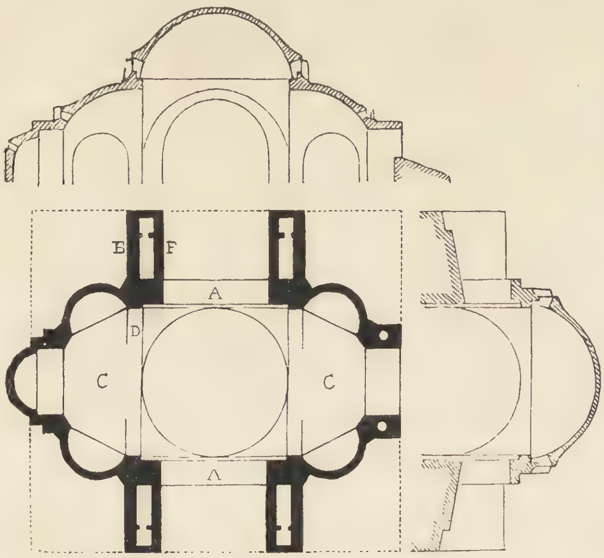

Fig. 60.

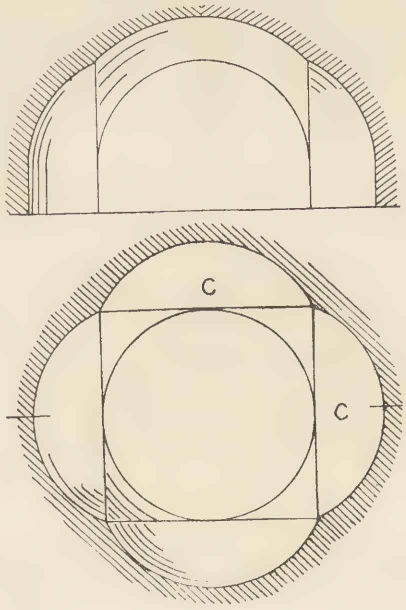

Fig. 61.

St. Sophia consists essentially of a pendentived hall, the central vault of which is supported on two of its faces by great niches, C C [system shown in fig. 61*], and on the other two frontages by face arches, A A [system shown in fig. 62†]. This is a new example of the composite method, wherein the two general systems of abutment are combined; but a glance at the plan [fig. 60] is sufficient to show that the two systems concurrently employed are far from affording equal security. The great niches, on the one hand, give ample assurance of equilibrium; but, on the other, the wall arches, A A, have only a restricted stability, and would, by themselves, be incapable of supporting thrust in their direction. The architect understood this; so he took care to add to the arches A some strong buttresses, the plan and elevation of which may be seen in E F [fig. 60]. These buttresses, in accordance with Byzantine practice, show no projection on the exterior of the building—the external wall being flush; and the buttresses are, as it

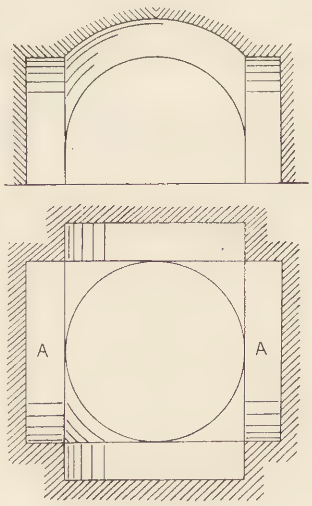

Fig. 62.

* This figure, showing the principle of abutment in the coupling of vaults on pendentives with abutting niches (*Association de voutes-à-pendentifs et de niches-de-butée*), is taken from ch. xi., on the "Butée des voutes."

† This figure, also taken from ch. xi., shows the coupling of vaults on pendentives with barrel-vaults (*Association de voutes-à-pendentifs et de berceaux*).

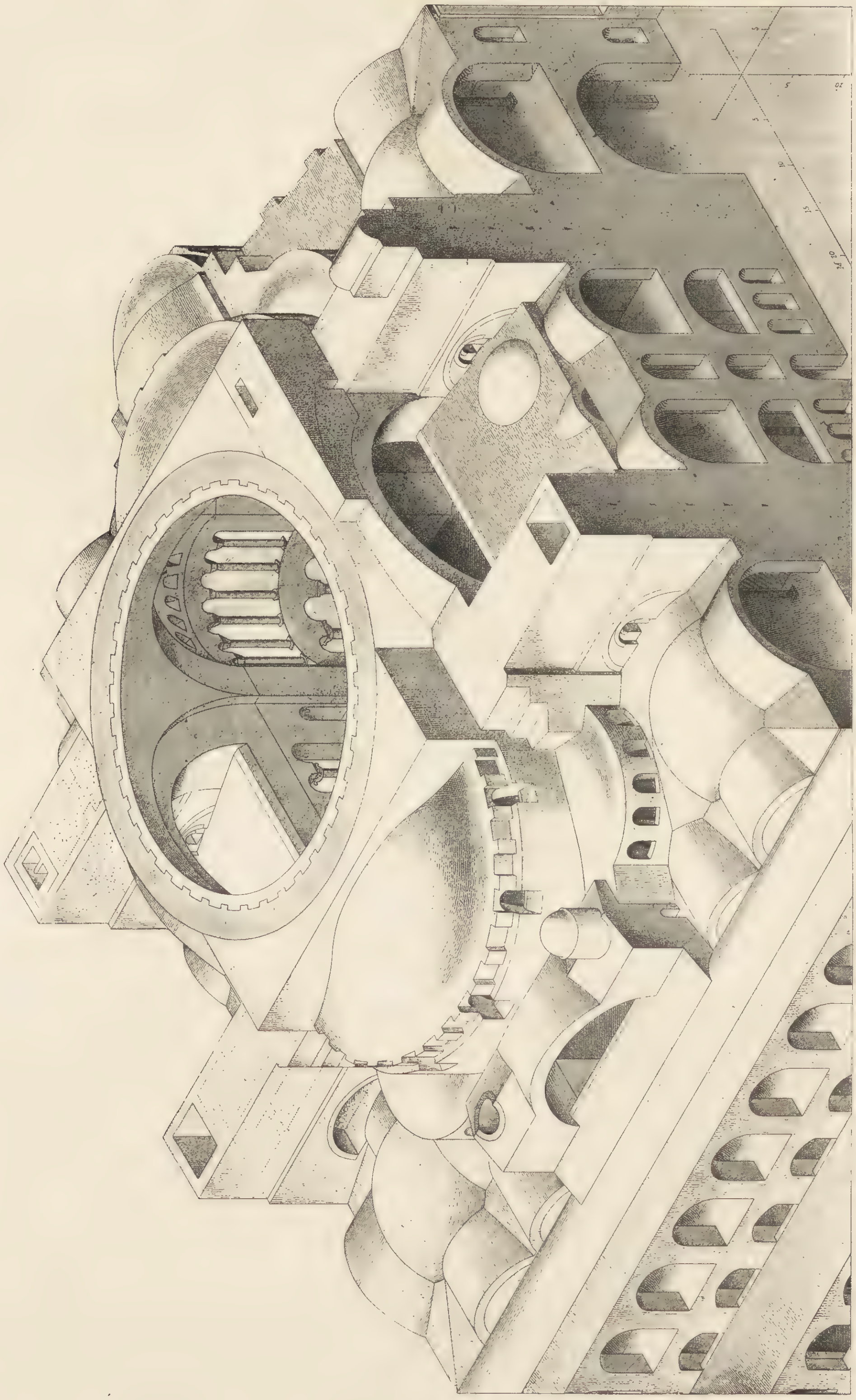

Fig. 63.—St. Sophia, Constantinople.
From *L'Art de Bâtir chez les Byzantins* (Pl. XXIV.), by M. Auguste Choisy.

Fig. 64.—St. Sophia, Constantinople.
From *L'Art de Bâtir chez les Byzantins* (Pl. XXV.), by M. Auguste Choisy.

K K

were, partition walls which rise above the flat roofs of the aisles (*collatéraux*) to support the cupola. Each of these walls is double, and each is composed of two spurs (*éperons*), E and F, bound together and of unequal thicknesses. The thicker spur, E, abuts directly against the transverse arch (*arc-doubleau*), D ; and that is exceedingly well arranged, for this transverse arch, D, resolves the weight of the dome into thrusts; the other spur, F, is placed with its back to the pendentive itself, and prevents it pushing out [fig. 60, and also figs. 63, 64].

Now let us examine the aisles : they are shown in perspective in fig. 64 and in section in fig. 65. The first impression to which this figure gives rise is that of an

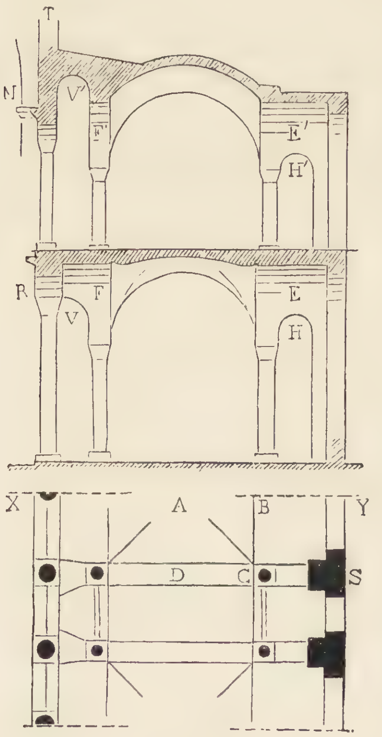

Fig. 65.

arrangement wherein the height is the result of a preconceived scheme. Two storeys are superposed : the more important of which shows an elevation hardly equal to its width, and the other is still lower ; then, immediately above, comes the springing, N, of the cupola. To gain height in order that the thrust of the central dome should fall as low as possible was evidently the dominant idea. As for the equilibrium of the aisles, it may be summarised as follows :—The principal vaults, A on plan, produce in the direction A Y, (1) a direct thrust which is distributed through the whole length C B ; (2) a local thrust transmitted by the transverse arch, D, and concentrated in C. The thrusts which act directly on C B are supported by the wall arches (*arcs-formerets*) E [system shown in fig. 62], and those which are transmitted by the transverse arches, D, are neutralised by the spurs C S. Towards the great nave the static arrangement is, in the main, similar, but in a more complex form. It is no longer a system of large wall arches which resist the action of the vaults, A ; it is a double row of transverse vaults, V, V′, the stability of which is ensured by the enormous vertical weight of the lunette, T. The arrangement of these vaults, V, V′, differs in the two storeys. In the upper storey they are simple cradle vaults, the springing of which starts from the wall arches F. In the lower storey, through lack of height, the architect was content with half-cradle vaults, V, into which the wall arches F penetrate. In fact, the system of shouldering the vaults A is wholly internal. The wall arches of abutment, E E′, F F′, save room ; the spurs which carry them get their own support from the outer wall ; the whole space is utilised, and the building allows one to take in at a glance the whole economy of its equilibrium. The effect of this construction, wherein the buttresses are almost all replaced by abutment vaults, is surprising by reason of its boldness—boldness which, it must be added, was somewhat rash, and which, on more than one occasion, has endangered the very existence of the

monument. At the first * earthquake the dome, which was too flat, and perhaps insufficiently supported, fell in, and had to be rebuilt in a manner that caused less thrust—that is, with more rise.† It was necessary to strengthen the wall arches north and south by covering them with a mass of material, the arrangement of which will be at once understood on comparing the two halves of the perspective view in fig. 63.‡

Then came the subsidences. The soil on which rested the four piers of the dome was compressed by the weight on it much more than the rest of the foundation. The vaults carried between these piers and the exterior walls were crippled by the movement, and had to be supported by the arches, A, put under them, which choke the aisles [fig. 66]. The pavement of the women's gallery slopes towards the interior so as to be perceptible to the eye. (And I am speaking here merely of the damage done in less than half a century. St. Sophia is at the present time completely enveloped in masses of strengthening material, which had to be continually accumulated about the building to prevent its ruin). Despite the imperfections in the details of its original

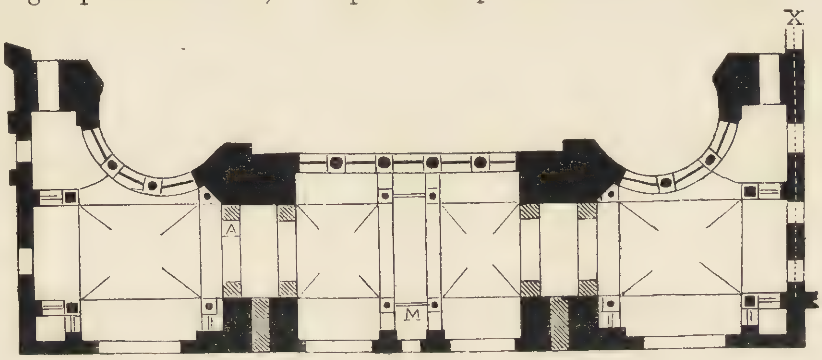

FIG. 66.

construction, St. Sophia has lasted more than thirteen hundred years, and still stands out as one of the most powerful creations of architecture. Its conception was too original to be realised without defect at the first attempt; but the idea was taken up by the architects of the Byzantine school, who unceasingly did their best to remedy its defects while following up the original scheme; and the best way to discover the points wherein the model was defective is to compare it with the copies which have been made of it.

The earliest imitation come down to us helps to rectify a twofold error. At St. Sophia of Constantinople the wall arches A of the great cupola [fig. 60] offered an

* It was after the second earthquake that the dome was rebuilt and raised.—G. A.

† Agath., *Hist.* v. 8; Theophan., *Chronogr.* A.M. 6051; Cedren., *Compend.*, ed. Bonn, t. i. p. 676. Agathias restricts himself to the statement that the new cupola was of greater height; Theophanes and Cedrenus add that the rise of the new cupola surpassed that of the old by 20 feet; Zonaras gives the figures as 25 feet. The only writers who differ from those cited belong to the later times of the Byzantine Empire, and, on their own merits, deserve but very limited credence; they are Glycas, Codinus, and the Anonymus of Banduri.—A. C.

‡ This perspective shows, on the right, St. Sophia as it is at the present day; on the left, St. Sophia as it was before the addition of the mass of material referred to in the text. This addition, moreover, is not mere supposition; I have verified the fact of the complete absence of tie between the primitive square body surrounding the dome and the added material which strengthens it and ballasts the piers.—A. C.

insufficient resistance, and it was necessary to add buttresses to them—an inadequate solution and a lamentable compromise. Furthermore, by a departure from the

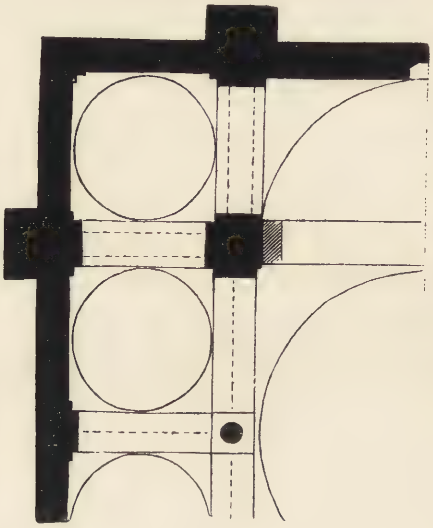

Fig. 67.

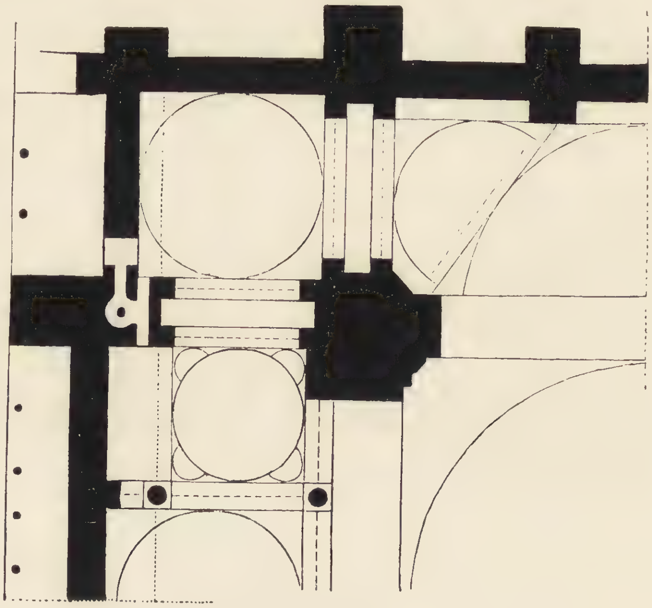

Fig. 68.

customary rules, the wall arches A were relegated to the exterior, so that their thickness became lost to the eye. At St. Sophia of Salonica [see fig. 51 *ante*] the

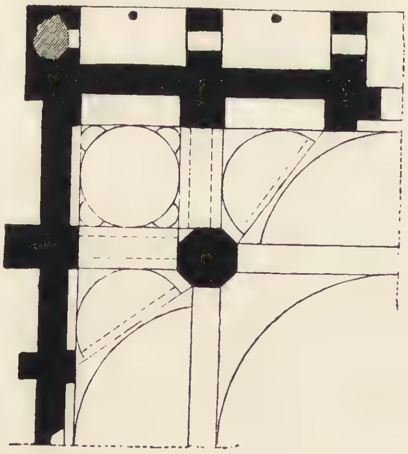

Fig. 69.

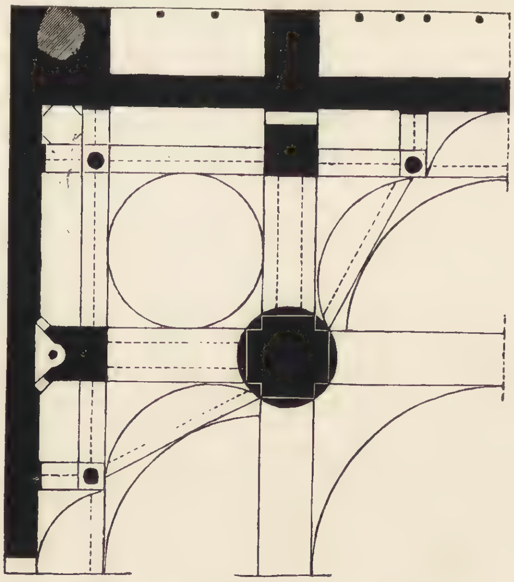

Fig. 70.

wall arches are put back into the interior, and are of sufficient strength to require no additional help.

At the time of the Ottoman invasion, in the mosques which the Greeks built at

Constantinople for their new masters, we see the primitive plan of St. Sophia approached yet more closely: a cupola on pendentives, buttressed on two of its frontages by semi-domed vaults, and on the two others by wall arches, was the scheme adopted in turn by the architect of the Bayezidieh, and by Sinan the Greek who built the Mosque of Soliman. The Bayezidieh [fig. 67] is, indeed, but a much simplified reduction of St. Sophia—St. Sophia on a smaller scale, with only one storey of aisles. At the Souleïmanieh [fig. 68] the imitation displays more freedom: the great wall arches pass from the exterior to the interior, and the buttresses employed to aid them rise by steps. But the Souleïmanieh (finished about 1560) is one of the latest pendentived halls in which the means of abutment differ on one side and the other. To support a cupola by wall arches on two sides and by semi-domed vaults on the two others is a method which may be justified by convenience of distribution; from a constructor's point of view, it is an anomaly to which Greek architects were not long in putting an end. A cupola, square in plan, exerts an equal thrust on its four sides, it therefore admits of identical means of abutment on all four sides; whether wall arches or vaults in niches, architects persist in considering both methods as good, but they no longer use both in combination. The mosque of Shah-Zadeh [fig. 69], built in the very lifetime of Soliman, shows the complete acceptance of this reform. Four fundamental sides, four abutting apses—thus henceforth may be summed up—was the typical plan. This plan is reproduced in the Mosque of Ahmed [fig. 70], with dimensions equal to those of St. Sophia; it will also be found in the Valideh-Djami, &c. At last came the idea of multiplying resistances by distributing the thrusts upon eight points of support instead of four, which led to the substitution of squinches for pendentives; and this step was accomplished by the Greek architect to whom Selim II. entrusted the great Mosque of Adrianople. The plan of this magnificent building is given in part in fig. 71. It marks the latest form that the mother-idea of St. Sophia assumed, and the development which we have been following plainly shows, I think, the logical link which connects with one another these two extremes in the manifestation of the same thought.*

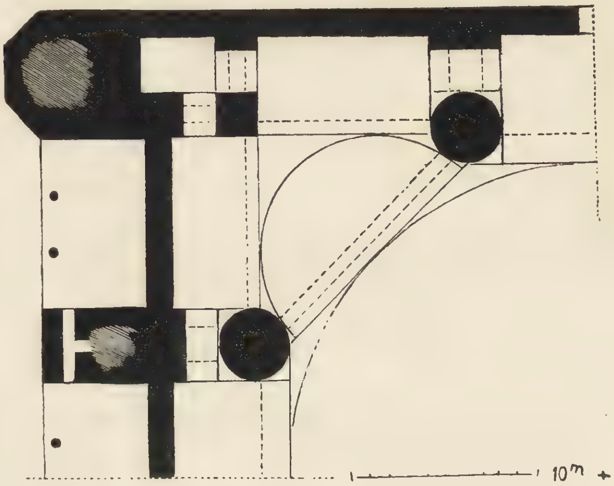

Fig. 71.

(Signed) Auguste Choisy.

* *L'Art de Bâtir chez les Byzantins*, par Auguste Choisy, Ingénieur-en-chef des Ponts et Chaussées. Fo. Paris, 1883. Ch. xii.

ABSTRACT OF THE DISCUSSION.

Mr. R. PHENÉ SPIERS, F.S.A. [*F.*], thought no building in the world produced an effect parallel to that which one obtained on entering the great Mosque of St. Sophia. Though to a certain extent it was wanting in that beauty of colour which would be found if the plaster and paint with which the mosaics were now covered were removed, the effect was still retained by the exquisite colour of the columns and of the marbles on the walls. But the great beauty of it was that which was obtained by being able to seize the grandeur gradually by the various proportions of its parts. The whole building was gradually subdivided: first, the great central space with its dome; secondly, the two side apses, of stupendous size; thirdly, by the apses leading out of them being slightly smaller than the great apses, to which again scale was given by the two floors of galleries one above the other, subdivided into three parts by columns with their capitals covered with minute detail; so that in the course of a few minutes, on looking at the building, one really began to realise its size. The professor had brought before them the various features of the interesting style of which he had spoken, and he had also drawn a moral. The advice in his moral was carried out to a certain extent in the French school, where the Mosque of St. Sophia, as illustrated in Salzenberg and in Reynaud's *Traité de l'Architecture,* the text-book of French students, was frequently referred to by them. In fact, the Neo-Greek style in France was based much more upon Byzantine than upon Greek elements. He could cordially re-echo the professor's sentiments. He would have liked, however, to see a little longer duration given to the Byzantine style. The professor fixed the period at 1,123 years—from the time of the removal of the Empire to Constantinople to, probably, the taking of that city by the Turks; but it would be well to direct the attention of students to the fact that the elements of Byzantine art existed for centuries before that, in Central Syria and elsewhere, and that they might go back another couple of centuries to find some of its earliest features. As a matter of fact, curious as it might seem, by bringing all his Roman architects to Constantinople, Constantine really retarded the development of the Byzantine style for probably half a century. It was a singular and peculiar judgment on him that of all the works which he erected at Constantinople by the hands of Roman workmen, not a single one remained, and it was only in the cistern of the 1,001 columns, and in the Yerebatan Serai, both of them executed by Byzantine workmen, that two examples of his work existing at the present day were found. He would have done better if, instead of being in such a hurry, he had trusted to those Eastern workmen who had been the builders of that magnificent system of vaulting which the professor had brought before them. The Neo-Byzantine style had been continued in Russia till nearly the end of the seventeenth century, so that, instead of 1,123 years, about fifteen centuries would be more correct. He did not understand one expression of the professor's, which was that the Church of St. Sergius was without pendentives. It was certainly shown without pendentives by M. Choisy, but he was afraid that

M. Choisy, in that particular case, was wrong. If it were a fact that there were pendentives in the Church of St. Sergius, it was extremely probable that San Vitale had been copied from it, the only difference being that the Church of San Vitale had a simple arch thrown across the angle, instead of a spherical pendentive. Another point was the date of St. Sophia at Salonica, which was recognised, according to the Greek tradition, as having been built by Justinian. Professor Aitchison stated that it was not possible that that could have been the case, first because it had three apses, and secondly because it had a drum. The speaker had been informed that the two side apses were subsequent additions. As to the question of the drum, he thought that, according to Procopius, the construction of the Church of the Holy Apostles at Constantinople left no manner of doubt that there had been a drum in that church—that was to say, that the windows had been in a space underneath the dome. The description given by Procopius seemed to be perfectly clear. If that were the case, it was quite possible that it might have occurred at St. Sophia in Salonica. In that church the drum was carried up square externally, so that a great weight was thrown on the corner piers, and it had the effect, till the disastrous fire, of resisting thrust, the danger of which had been so much feared in the Mosque of St. Sophia at Constantinople. There was also an inscription which had been found in the mosaics in the central apse at Salonica, which had been read by Duchesne and Bayet as applying to a bishop by whom they had been put up in the sixth century. As to the date of the triapsal arrangement in the Greek Church, it was not introduced until after the reign of Justinian the Second (A.D. 670–711).

Mr. ALEXANDER PAYNE [*F.*] considered the period of Byzantine architecture to be perhaps one of the most original. The reason, he thought, was not far to seek—it was, that the whole needs of Christendom then were quite different from the needs that had gone before. The old Roman Empire had fallen, and the architects had to work out new problems altogether. Hence that extraordinarily interesting period of architecture. The real birth of the style was in Syria. In the Marquis de Vogüé's book—a book not well known except among architects—almost all the types of the churches were to be seen that were afterwards found in Constantinople. In the streets of old Stamboul, and in the old mosques there, were many examples that were not in the least known or illustrated, in which problems of new domes were brought in, and an entirely new system of building, differing from the Roman. The towns best known in the old Byzantine Empire were Adrianople, Constantinople, Salonica, and Athens; and if those four towns were so full of such interesting remains, how many might there not be in other towns not yet explored, the greater part of Turkey being a *terra incognita* to architects at present? It was not difficult to trace descent from these Byzantine buildings to the Italian shores at Venice, Ravenna, and Torcello, and along the line of the main European thoroughfare to the Romanesque, and on to the Norman, gradually developing into the Mediæval; so that probably the Gothic cathedral really began in Byzantine architecture. As to the modern development that might be expected in the future, when they got the same

conditions as those of Byzantium—that is to say, when they had a new order of things, a new form of religion, and new problems to solve—then they would have a new architecture.

Professor KERR [*F.*] said the fact of Byzantine architecture being essentially based on the use of the dome had been recognised; the fact of domical construction, as he might call it, coming from Asia had also been recognised. But an interesting Paper might be remembered, read by Mr. William Simpson a few years ago, upon "Mud Architecture," * as it was called, in the course of discussion upon which it was found that the term "Mud Architecture" was not to be taken as a term of reproach, but as one which indicated a mode of construction *sui generis,* and productive, in point of fact, of what they had seen that night. The earthen, or more properly concrete, building which existed to this day in the East, and had always existed in the East from the dawn of history, was that which had produced those domes. When the old Roman system of what might possibly be called religion broke down, as all religious systems (except their own, of course) must break down sooner or later, the Christian system (which was the opposite reaction from the Roman system, namely, the worship of the heroism of martyrdom or suffering, as distinguished from the heroism of violence) required different forms of building display, and architecture—their most honoured and most loved art—answered to the call, as it always did, with perfect promptitude. But the circumstance of the seat of empire having been transferred, for purely political reasons, to Byzantium had brought the headquarters of Christianity into immediate contact with the semi-barbarism of the farther East; and thus it was that the domical architecture, which sprang up at Byzantium and spread around from Byzantium, was not assisted in the slightest degree by architects brought from Rome, but was the production of the architects or builders who belonged to the surrounding territory. That was why the domes fell: because the more pretentious structures which were rendered necessary for the conduct of the ritual of Imperial Christianity involved more skill than the region round Byzantium could furnish. A glance at the drawings would show that domical construction was an entirely different thing from arch construction. There were three structural systems of architecture at this time of day in past history: there was the architecture of the column and lintel, which, of course, was identified with the works of the Greeks and Romans, the founders of all modern civilisation; there was the architecture of the arch (that was to say, the arch in the wall), with the vaulting which sprang out of the use of the arch in the wall, which was identified with mediæval practice; but there was, thirdly, the architecture of the dome, because the dome was not an arch. Mr. Tarn, who was present, and whose name had been quoted as an author on the subject, would, he had no doubt, confirm him in saying that the principles upon which the equilibration of the dome was based were entirely different from those upon which the equilibration of the arch was based. Now Lord Grimthorpe, a distinguished mathematician, once a member of the Institute, but not so then, some years ago had read a Paper on Domes there.

* Transactions, Vol. III. N.S. p. 57.

The fault of Lord Grimthorpe's theory, if he had not already abandoned it, was that he supposed the dome to be constructed of loose or disconnected stones, which, of course, as Mr. Tarn would say, was absolutely impossible. A dome in its most proper form must be constructed of rings, and if those rings individually were incapable of being disjointed, the dome was simply a dead weight. If they looked at some of the drawings which showed what had been called a drum, they would see there was no drum on the walls at all; the so-called drum of St. Irene was simply the loading of the haunch of the dome. The drum of St. Sergius was the loading of the haunch of the dome; and so also in the case of St. Sophia. The drum as exhibited at St. Paul's or St. Peter's was entirely absent in all Byzantine work of the class. Later in the day Romanesque, and he supposed some of the Byzantine examples, developed the drum. The dome in all those cases was simply an inverted cup, and if one could construct that cup of concrete in any form, and if one could equilibrate the section of that cup so that it should not become disturbed by its own pressures, the whole structure would become simply a dead weight; and it was of no use to talk about thrust, because when one began to perceive the influence of thrust, the probability was that the dome would fall, like those which fell in the days of Constantine. Byzantine architecture had the great merit of being a peculiar style founded upon the use of the dome. Now the earlier domical works in what was called Syria were small, and were based upon the idea of having a circular church. Why the church of that early time was to be circular he really forgot, but at all events it was very clear that in all those works the circular church was the root of the arrangement, and the circular church was obviously at the root of the domical idea. Well, then, it was said they were in a position to learn from everything that they studied, and it was suggested that they were in a position to adapt the results of such study with advantage, so as to produce a new style of architecture. He did not think they were proceeding in the direction of a new style of architecture at the present day in Great Britain, or in any other country for that matter, similar to that of the Byzantine. The Americans were practising what they considered to be Romanesque just then. Whether it would withstand criticism, as regarded the proper application of the name, was a question he would not discuss then; but he would like those interested in the progress of architectural design to pay a little more attention to what was going on in America. They would find a remarkable development of independence, and independence of a most meritorious kind. But the work of Richardson was not like Byzantine work in any respect, and whether the Americans would develop an American style out of what they called the Romanesque he did not know. The Provençal architecture, which Richardson had adopted, and which his followers had carried out with remarkable vigour, was well worthy the study of any one interested in the matter, although he did not suppose that it could ever be made to apply to work in England, or that the Byzantine would. With regard to domes, the great conical roof of the Exhibition Building at Vienna * had a

* Erected in 1873, and described by the late Mr. Scott Russell in a Paper entitled "The Central Dome of "the Vienna Exhibition Building." See TRANSACTIONS, 1873–74, pp. 103–140.

dome to all intents and purposes, just as an arch had its elements in two inclined stones meeting at the top, or with a keystone between the two at the top. It was a most amazing structure, so far as the manifestation of the simplest skill was concerned. It was all iron (a material of which they had every reason to be suspicious at the present day as regarded its development in the future); but it showed that the principle of domical construction, if only in its conical form, was still capable of being worked out by careful study for the purpose of covering vast areas in the simplest possible manner.

Mr. E. P. LOFTUS BROCK, F.S.A. [*F.*], called attention to the interesting construction, that many only knew of from foreign notes, of the dome of San Vitale at Ravenna, which was composed entirely of hollow pots, with the foot of one put into the neck of the other, bedded in concrete. He also referred to a resemblance between the plan of that church and the Church of St. Sergius at Constantinople. There at once they saw the way in which one form was produced in early times and retained; how from the early Roman work they got that most interesting church at Ravenna.

Professor AITCHISON, A.R.A. [*F.*], replying to Mr. Spiers, said he accepted M. Choisy's view that these Persian domes were of the time of the Achæmenides, in the eighth century B.C., and not that of MM. Perrot and Chipiez that they were of Sassanian times, in the third century A.D., for this reason: where did Agrippa's architect get the idea of his dome from? It was supposed to have been built in the year 27 B.C., and if these large Persian domes were not built for two hundred and odd years afterwards, whence did he get the idea?* It was not to be supposed that a dome of the size of the Pantheon's had been constructed at once from nothing bigger than a furnace dome or the dome of a well. Could it be maintained that any architect, however great, would start from such beginnings a dome of upwards of 140 feet in diameter? As to the archæological discussions, he thought that the arguments of M. Choisy were more cogent than those of MM. Perrot and Chipiez. He believed Mr. Spiers was wrong in the belief that St. Sergius had pendentives. At San Vitale there were small pendentives which could have been replaced by corbels no bigger than those of Minerva Medica. As to St. Sophia at Salonica, the Rev. Mr. Crosbie, the English antiquarian there, had with another antiquarian examined the church, and both were confident that the three apses were of the same date and had been built at the same time as the walls. If those three apses were coeval with the starting in the West, that showed that the church was several centuries later than the great St. Sophia. There was, too, a combination of circumstantial evidence to show it. In this church at Salonica there was a much better effort to abut the dome than in the former; and it was not likely the architect would have used so much extra abutment if it had been built before the failure of the great one, but it did seem probable that, having found the great one too weak, he should strengthen the other; and there was a drum as well. Procopius did seem to favour the idea of a drum at the

* The Pantheon of Rome is now stated to be of the time of Hadrian, who died in A.D. 138; the Sasanian dynasty began in A.D. 226.—G. A.

Church of the Apostles; but M. Choisy was of opinion that he alluded to the windows in the dome. Mr. Payne spoke about a new style. He (the speaker) might say that no new style could be perfectly evolved in their time, but the time had arrived when they wanted one. Browning said that it was impossible to express the thoughts of to-day in the language used by the Greek poets and orators.* It was impossible in architecture to express by Greek, Roman, or Gothic forms the whole of the ideas that they should express. Professor Kerr, in speaking of domes, said that the loading at the haunches was not a drum—and technically it was not, in such cases as those of St. Sergius and the great St. Sophia; but there were cases where the dome sprang from the top of a cylinder, as at St. Irene. As to the origin of the dome, it had been suggested that it was first made in alluvial plains by mounds or vast ant-hills being accidentally covered with some concreting substance, probably with mud, and that the inhabitants scraped them out and used them as cabins. Mr. Brock spoke about the dome of San Vitale being formed of hollow pots. The last time he was there he had wanted to go up and see them, but the custodian assured him that they were so carefully plastered over that nothing could be seen. The fact of its being so built, with the small end of one going into the larger end of another, had been amply proved. Those pots made a light dome, and being set and laid in good mortar they formed a perfectly firm and solid substance, and as they went round in a continuous spiral there were no horizontal joints to open. They had been used in England at the Cutler Street warehouses of the old East India Company, by the father of Professor Cockerell, and he believed St. George's Hall at Liverpool was vaulted with them, or by hollow voussoirs such as were used by the Romans at Bath. All kinds of devices had been used by the Byzantine architects to lighten the load and to restrain the outward thrust of their domes. One plan was to use Roman pantiles, which were nearly half round; the lower course laid the natural way, and the upper course reversed so as to form a key, and when these were set in mortar they formed a perfectly rigid shell lighter than the Roman vaults. In those domes, if thick enough, there was no thrust when the work was once set—no more than in a teacup turned upside down.

Mr. E. WYNDHAM TARN, M.A., remarked that if there was no thrust in a dome there was nothing to calculate, as was the case with that of Vienna, alluded to by Professor Kerr, which was like a teacup turned upside down. Mr. Scott Russell had read a Paper some years ago upon that dome, and described the way in which it was riveted together, so that there was no thrust to resist—it simply stood upon columns. As to the domes referred to in the lecture, there might be thrusts or not according to the material of which they were constructed; and as to the drums, it struck him that constructionally St. Sophia had a drum, and, after investigation of the thrust of that dome, he had taken it that the dome structurally ceased where the thickness began, and was brought down on the curve inside, but outside there were buttresses and heavy piers to resist the thrust. He considered that that dome structurally was not a semi-circular dome, but a segmental dome, the same as in St. Sergius and the other domes

* *Life and Letters of Robert Browning*, by Mrs. Sutherland Orr. 8o. Lond. 1891.—G. A.

in which there were drums; the dome really ceased where the pier began. What he called the drum really acted as an abutment. It was curious that in his calculations the point where that thickness began was just the weakest point of the arch, where the thrust was greatest, and where that buttress was introduced. He did not say that they actually calculated it in the same way, but the extra thickness seemed to be introduced to resist the thrust of the dome.

XCV.

THE CENTRAL PILLARS OF MILAN CATHEDRAL.

By LUCA BELTRAMI, *Hon. Corr. Member* (*Milan*).

Mr. J. Macvicar Anderson, *President*, in the Chair.

MR. PRESIDENT AND GENTLEMEN,—

I AM glad to be able to complete Mr. Somers Clarke's interesting Report on the fall of one of the pillars at Seville Cathedral,* with the result of some investigations carried out recently in the Cathedral of Milan, in order to ascertain how the central pillars were built, what were the causes of their decay, and what the remedies applied to keep them in good repair. Before, however, touching on these investigations it may perhaps be desirable to give a sketch-plan [fig. 73] of the whole building, which I have extracted from an old and well-known work, and a couple of views of the interior showing the columns in question [figs. 72 and 74]. It will thus be seen how wide is the difference between the two cathedrals of Milan and Seville, and how difficult it is to attempt a comparison between them.

The large piers bearing the whole weight of the pinnacled lantern have been long supposed by many experts to consist of a core of common stone (*sarizzo*), faced with white marble of Gandoglia. This facing, according to the principles of restoration followed up to a few years ago, was cut off here and there, or wherever it showed some splitting or superficial decay, and was replaced with new pieces of marble about ten or fifteen centimetres thick. In the long run this proceeding would have diminished the section of the pillars, which some never believed to be *faced*; and, as Superintending Architect of the Monuments of Lombardy, I felt it my duty to ascertain what the real structure of the pillars was, for which purpose the Ministry of Public Instruction appointed a committee of architects and builders.

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* TRANSACTIONS, Vol. VII. N.S., pp. 169–194. The illustrations provided by Mr. Somers Clarke included a sketch plan of the pillars of Milan Cathedral, which was imperfect, as may be seen by the measured plans here given. With reference thereto, Mr. Somers Clarke has stated that the dimensions he gave in his Paper were taken from rough measurements of his own, and from the book issued to architects who competed for the design of a new façade for Milan Cathedral.

FIG. 72.—PILLARS OF MILAN CATHEDRAL: FROM THE GREAT NAVE.

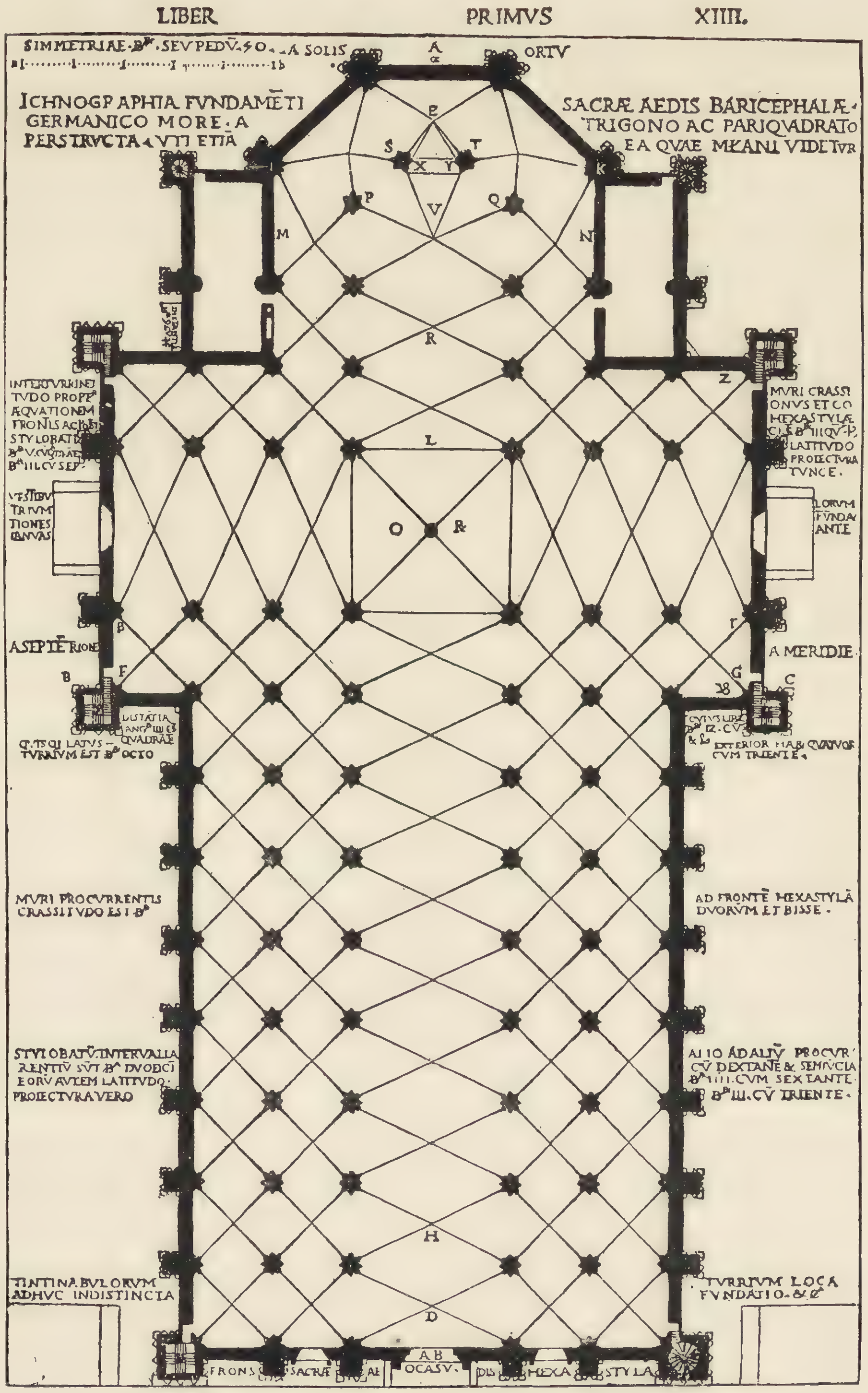

FIG. 73.—PLAN OF MILAN CATHEDRAL.
(From the Commentaries to Vitruvius by Cesariano. Como, 1521.)

The investigations began in the south-eastern central pillar, which was drilled to the depth of ninety-seven centimetres, boring two blocks of marble, after which the sarizzo was reached. The same pillar was drilled through the course immediately under

Fig. 74.—Pillars of Milan Cathedral; from the minor Nave.

that which had been tried in the first experiment, and the sarizzo was met at thirty-five centimetres of depth.

The next experiments were carried out in the north-eastern central pillar, and the sarizzo was met at the depth of ninety-four and of sixty-six centimetres in one course, of fifty-two centimetres in the course under it, and of twenty-eight centimetres in the course upon it [figs. 75, 76]. Thus the proof was obtained that the thickness of the facing of marble varied at least from twenty-eight to ninety-seven centimetres; that the builders of Milan Cathedral had meant to erect the central pillars as solid shafts; that they considered the resistance to pressure of the white marble as great as that of the sarizzo stone. The fourteenth-century list of prices of such building materials, preserved in the archives of Milan, shows that sarizzo cost only one-fourth the price of marble; and we may account for the employment of some pieces of marble in the core of the pillars by supposing them to be small cuttings, unfit for decorative purposes.

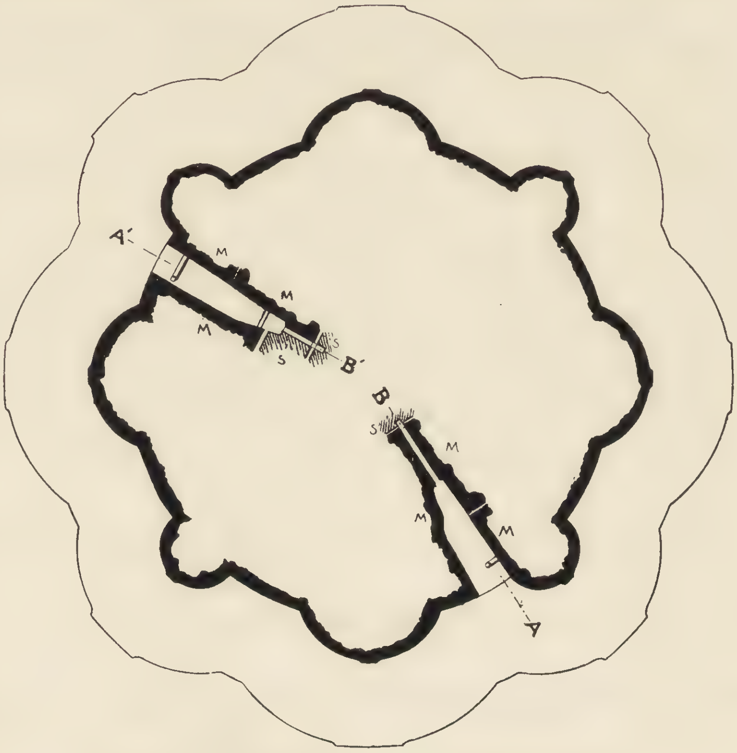

Fig. 75.—Horizontal Section of the Central Pillars.
A–B, Investigation in the South-eastern Central Pillar. A′–B′, Investigation in the North-eastern Central Pillar. M, Marble of Gandoglia. S, Sarizzo Stone.

The two materials having been considered equally sound by the mediæval builders, it was thought useful by the Ministerial Committee to investigate, with careful experiments, their actual resistance to pressure. Such experiments were carried out by the

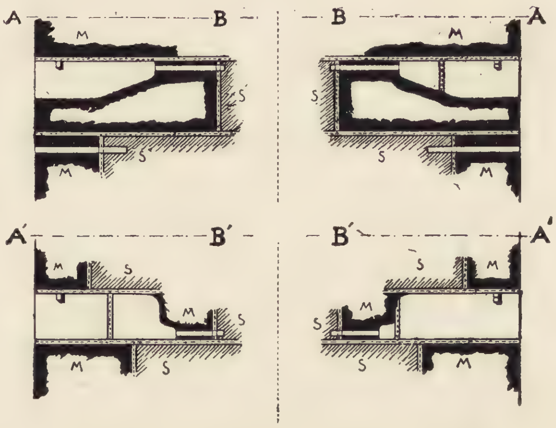

Fig. 76.—Perpendicular Sections (see fig. 75).
M, Marble of Gandoglia. S, Sarizzo Stone.

building-construction department of the Technical Institute of Milan, and gave the following results:

The resistance to pressure of the white Gandoglia marble was ascertained, by seventeen experiments, to be of 5,121 kilogrammes each square millimetre in what we call *first stage* (up to the appearance of the first fissures), and of 6,898 kilogrammes in the *second stage* (general disintegration), in the new marble just come from the quarries of Gandoglia. The resistance to pressure of the same marble used by the old builders was ascertained to be of 5,126 and 6,929 kilogrammes per square millimetre.

The resistance of the sarizzo stone was ascertained, by sixteen experiments, to be of 5,269 and 6,657 kilogrammes per square millimetre.

These experiments proved that the average resistance of the sarizzo stone is nearly $\frac{54}{55}$ that of the marble.

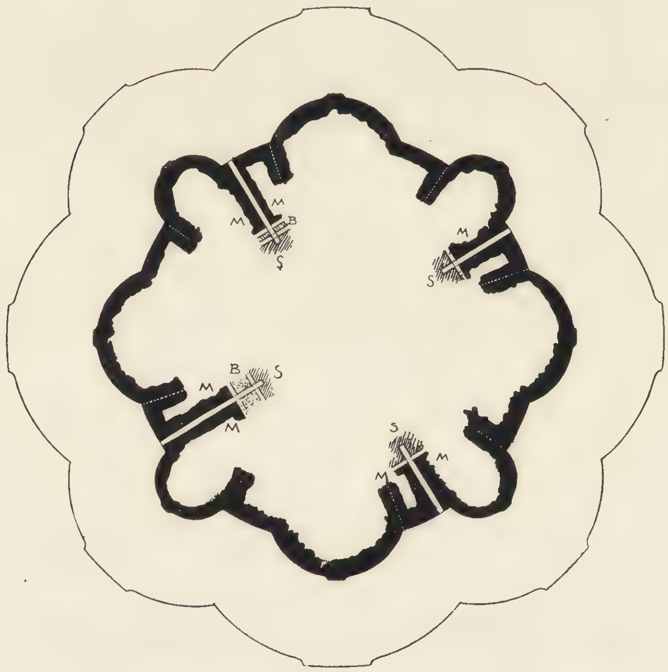

Fig. 77.—Horizontal Section of a Minor Pillar of the Nave.
M, Marble of Gandoglia. S, Sarizzo stone. B, Brick.

The surface of the horizontal section of each central pillar being 57,490 square centimetres, we know now that the pressure necessary to crush its materials would be from 29,788,565 to 38,960,973 kilogrammes.

The actual superincumbent weight was ascertained, by careful calculations, to be that of a mass of 4,924 cubic metres of mixed masonry, whose average specific weight is 2,650—that is to say, a total of 3,262,150 kilogrammes for each central pillar. Therefore, the weight supported by each central pillar of Milan Cathedral is one-ninth of resistance to pressure, and one-twelfth of resistance to crushing.

After having thus ascertained the resistance of the central pillars, as well as of minor pillars [fig. 77], it was thought useful to study the nature and the cause of their decay—causes which are inherent to the peculiar qualities of the materials.

The white marble used in the construction and decoration of Milan Cathedral comes from the quarries of Gandoglia, which were granted for this purpose by Duke Gian Galeazzo Visconti in the year 1385. Its layer is forty metres thick, embedded in a crack of the mica-schist rocks, divided into strata of perfectly white or light rose-coloured marble, with alabastrine transparency, divided by thin layers of pyrite, of chlorite, and of tourmaline, which make some beds useless for building purposes. The

saccharoid texture of the marble itself varies from the granular to the perfectly crystalline, and sometimes to the spathic form. The general structure is spathic, and affords a fracture according to the three surfaces of a rhomboid with diedral angles of 105°.

The sarizzo, a stone generally used in construction on the plains of Lombardy, is extracted from the sediments of the glacial period in the northern side of the valley of the Po. Its structure is granitic, much varied in texture, in most cases porphyroid, with crystals of feldspar and quartz, of a parallelopiped shape.

Of these two materials employed in Milan Cathedral, the marble only shows signs of decay, consisting in fractures or fissures perpendicular or tangential to the surface of the pillars.

The first fractures are attributable to the inequality or casual imperfection of the surfaces of horizontal contact—an imperfection which was, as far as possible, carefully avoided by the mediæval builders by working such surfaces with a fine pick-hammer, and laying the courses on a thin layer of good mortar. Another cause of the fractures may be the oxidation of the iron clamps originally used to hold together with the central mass the moulded blocks forming the surface of the pillars.* Such fractures and splittings are not, however, to be considered as dangerous, especially when limited to one course of masonry, and are not, therefore, to become a pretext for tampering with the original surface of the work.

As to the tangential fractures and the chipping off of the edges of the facing courses, these are caused by the fact that in many cases the pressure was transmitted from course to course along the edge, or by a concentration of the pressure around the periphery of the pillars, consequent on the condensation of the mortar. The peculiar nature of the splittings depends upon the spathic structure of the marble. This defect is to be considered as a natural consequence of the care taken by the mediæval builders to obtain a perfect surface in the pillars they erected, and to avoid the penetration of damp into their core. Only the largest fractures are to be repaired—that is to say, such as are dangerous, or which alter the architectural appearance of the masonry—leaving untouched the minor ones, as testimony of their peculiar structure and form of decay, and of their age.

Mr. Somers Clarke's opinion † that the Cathedral of Seville stands far above that of Milan as a specimen of mediæval art is not easy to discuss, because the two buildings

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* "Et in medio piloni sunt lapides sarizii, bene splanati, et bene clavati, et ad majorem fortitudinem sunt "clavati cum clavelis ferri pomblatis ubique."—*Annals of Milan Cathedral*, I. 203.—L. B.

† See Transactions, Vol. VII. N.S., p. 177, for Mr. Somers Clarke's opinion, which Signor Beltrami here traverses. To the remarks made by Signor Beltrami in the concluding paragraph of this Paper, on the subject of Mr. Somers Clarke's comparison of the Cathedrals of Seville and Milan, the latter replied as follows :—"In "answer to the concluding sentences of the printed Paper, I have to say—(1) that I have visited the Cathedral "of Milan several times. (2) That I cannot affirm that the vaults have not the ribs through their substance, "but I can affirm that they are domes rather than intersecting vaults. They are not on the lines of the best "mediæval vaults. (3) I respect Signor Beltrami's statement very much, but I can only affirm what every "student knows—that the columns are quite cut off from the members of the arch above them. A reference "to the drawings I have referred to shows this, outside one's examination of the church itself. (4) The same "drawings show the clerestory windows of the centre nave to have their lower part opening into the nave, "their upper part opening above the steep sides of the very domical vaults. This is very easily seen as one "walks along the aisle roofs."

were not erected contemporaneously, and they are not of the same size. In any case, I feel sure that the learned antiquarian would himself change the ground for such an opinion if he availed himself of the first opportunity to verify on the spot that the vaults of Milan Cathedral are *not* domes with ribs on their faces, that its columns are *not* quite cut off from the members above them, and that the windows are *not* in many cases half sham.

Luca Beltrami.

XCVI.

WROUGHT-IRONWORK: RENAISSANCE PERIOD.

By Mr. J. STARKIE GARDNER.

Mr. J. Macvicar Anderson, *President*, in the Chair.

MR. PRESIDENT AND GENTLEMEN,—

I FEEL deeply sensible of the honour conferred upon me by this second invitation to address you on my favourite subject, the working of iron.* This industry I need hardly remind you is, like everything under the sun, subject to fixed laws which have regulated its growth, development, and decay. Its signs of youth are to be discerned in a robust and playful vigour, when the blacksmith manipulates the iron while it is hot with his hammer, without any adventitious aid whatever. Such forms as can be obtained from the anvil he produces; and when something is required too large to be welded-up in one piece, he either drills holes through the hot iron and rivets the pieces together, or else binds them with a wisp of heated iron which clasps them still firmer as it cools. The forms obtained are unsophisticated, and there are no mouldings or any such refinements. The next stage is an endeavour to introduce organic forms, in a decorative, not in a superstitious sense. Whether the smith used stamps or not makes no difference, the highest point to which the unaided blacksmith can attain has then been reached. Ironworking has reached its maturity when such crude results are no longer deemed satisfactory. Greater refinement requires more reflection and more deliberate methods. The introduction of mouldings, tracery, and other architectural features, necessitates more cultivation both in the designer and the executant. The file, the saw, the chisel, the drill, the punch are called in, and the crafts of the blacksmith and locksmith no longer stand distinct. Finally, this phase too is insufficient; the fastidious client requires greater finish, and the iron has to be turned on the lathe,—polished, carved, chased, repoussé, damascened, etched, and inlaid—in fact, treated exactly as a precious metal; wholly apart, mind you, from

* See the author's Paper (lxxx) "Wrought-Ironwork: Mediæval Period," in TRANSACTIONS, Vol. VII. N.S., pp. 143–167.

the question of painting in colour and gilding. This, the last stage, means old age and approaching dissolution. After which we may have a renaissance, when the process begins again.

This is what may be termed the life history of ironworking. At the outset it took a long time to pass through, like the lives of the Patriarchs; but in renaissances all the phases of development can be got through quickly, and without waiting for the patriarchal development to be completely ended, since the old and the new can obviously quite well overlap and run their courses side by side.

It seems so entirely in accordance with the title of this Paper to begin with Italy, that, though not the most convenient sequence, it appears the proper one to adopt. Not that the Italian Renaissance in any way benefited the smith; for the absolute contrary was the case, and the new birth for architecture, painting, and sculpture was actually a crushing blow to ironworking. The smith's art had already, before the Renaissance, made considerable progress in Italy, especially in association with Italian and Venetian architecture. For some reason the church grilles, which were its principal expression, had run into a groove, being almost always based on the quatrefoil. It is plain, from grilles at San Miniato, in Florence, at the Palace in Perugia, and elsewhere, that this form was merely a development of the circle, and the circle itself may perhaps have been suggested by the effect of the leaded roundels with which the windows of St. Mark's and other notable churches were glazed. Be this so or not, it is certain that the quatrefoil, or quatrefoil within a circle, never lost favour, but became a traditional form which was rarely departed from. The grilles of this design were, however, often surmounted by very deep friezes and crestings of the richest work, in which badges, mottoes, and dedicatory inscriptions were freely introduced; and these came to comprise heads of animals, leaves stamped in dies, and even difficult mouldings. The well-known tomb of Can Signorio in Verona, 1375, is a fine example of this work, and the illustration [fig. 78] is from the chapel of the Communal Palace in Siena, about 1350, showing one of the deep friezes. One at Orvieto is dated 1335, and the outer Treasury doors of St. Mark's and a plain quatrefoil balcony in Venice date back probably to 1310; so that the quatrefoil must be at least as old as the very beginning of the fourteenth century. Other well-known examples will occur to those who

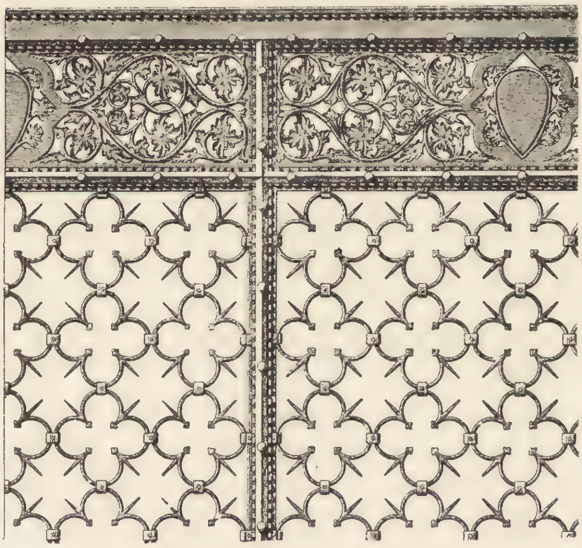

Fig. 78.—Part of a Grille in the Chapel of the Communal Palace of Siena.

have visited Florence, Prato, &c. But the style is far from widely spread, and is only concurrent with the Italian Gothic. Other styles, but all more or less geometric, were in use. The contemporary grille of twisted iron, closing the Barbazzi Chapel in the Church of San Petronio, at Verona, may be cited as an example of these.

How far the origin of the curiously Saracenic-looking Venetian ironwork was connected with these true Italian Gothic grilles, it is difficult to say; but it was

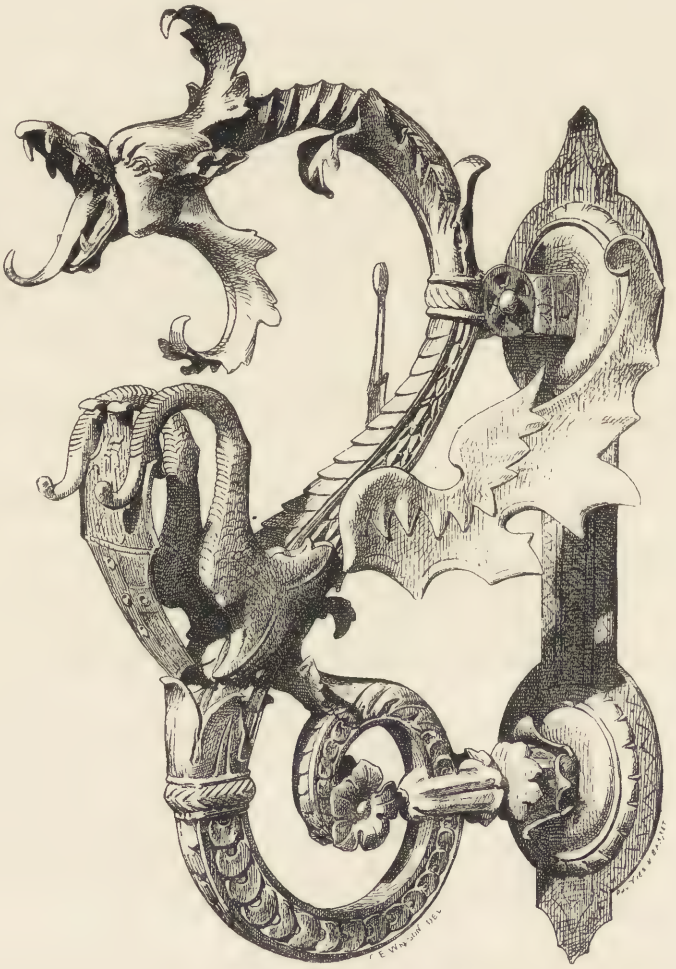

Fig. 79.—Knocker of Forged and Chased Iron—Italian, Fifteenth Century.

probably a parallel development. Though the Doge's Palace, and the Foscari and others, seem to possess nothing more decorative than lattice-grilles, even these occasionally show a tendency to introduce scroll-work, while the fifteenth-century Casa has some beautiful traceried grilles in the window-heads. We may, perhaps, imagine the evolution of Venetian ironwork to have been somewhat in this way. The entrances to St. Mark's are closed by open scale-pattern grilles, which we find copied in palace architecture, such as in the Vendrami Palace, by Pietro Lombardo in 1481.

Now it is scarcely conceivable that any smith could be set to copy a bronze scale-pattern grille without seeing that he could not only save a deal of labour, but also produce a far more decorative effect, by scrolling up the ends of the bars, forming the scales into C-scrolls. This is exactly what we find had really taken place in the nearly contemporary Manzoni Palace, where there are window grilles of C-scrolls laid horizontally so as to reproduce scales. From this to window grilles of C-scrolls placed vertically, and in all possible directions, are not only natural but inevitable steps; and when the C-scrolls have to be arranged in semicircular window-heads all the necessary requirements for the development of Venetian ironwork are opened up. Under Sansovino the style was at its zenith, and had spread far beyond the limits of Venice. Thus one of the finest examples is in the beautiful courtyard of the Bevilacqua Vicenzi Palace in Bologna.

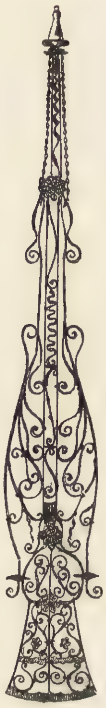

Fig. 80. — Venetian Filigree Fire-Shovel.

By the end of the sixteenth century Italian smithing had reached maturity. The beautiful lanterns, banner- or torch-holders, and horse-rings of the Strozzi, Piccolomini, del Magnifico, del Podesta, and other palaces in Northern Italy, make this quite apparent. The most famous worker of these objects was Niccolo Grosso, and the knocker [fig. 79] sufficiently illustrates this kind of work. The art was, perhaps, ripened—and, if we regard the knockers, caskets, beaks of gondolas, &c., almost beyond its zenith—when the overwhelming influence of Vitruvius on Italian architecture under Bramante, Palladio, Michelangelo, and their disciples, gave architectural smithing its *coup de grâce*. The concentration of artistic life in Rome, where no remains of ironwork existed, and the rigid adherence to the cold formulas in vogue, absolutely boycotted every kind of ironwork except such as was indispensable for protection; and this was only permitted to be fashioned of plain bars threaded together at right angles, or, very exceptionally, obliquely. Thus was Italian iron-working killed; certainly prematurely.

Fig. 81.—North-Italian Rococo Balcony (in the South Kensington Museum).

A renaissance in ironwork took place, of course, as soon as Palladian architecture degenerated and its rules relaxed, when slight attempts to embellish the monotonous and cage-like rows of window-grilles peep out, at first very cautiously, and finally boldly reintroducing the old designs—the quatrefoil, C-scrolls, and Sansovino grilles included. Though feeble and cheap, it marched onward, branching

out into ribbony filigree [fig. 80]—such as young ladies are fond of producing at the present day—into designs all over wavy tongues between the scrolls, suggesting liliaceous leaves and tendrils; then on to the lilies themselves, and so on to other flowers; and lastly, to the Italian version of French Rococo [fig. 81]. The screen in the Certosa at Pavia, produced in 1650, incorporates all that was known, and is, no doubt, an imitation of the Spanish rejas. The revived art was, however, feebly carried on; all the difficult parts necessary to prevent insipidity—the mouldings, bosses, vases, cherubs, and lions' heads—were cast in brass, and nothing was produced that required much hammering, heat, or welding [fig. 82].

If, owing to the influence of Vitruvius, the transition from Gothic to Classic iron-working cannot be traced in Italy, it is quite otherwise in Germany. The laws of Vitruvius were not current over the border, at least, not as applying to ironwork. I dealt last year with German smithing in its youth, and take up the story at the point of perfect maturity. The old French influence had died out, the newer Flemish impetus was absorbed, and the Cologne School had made its mark. The growth of the cities, the revival of learning, the discovery of the New World and of printing, profoundly stimulated the trade and manufactures of Germany, and led to the development of a distinctive German industrial art, under which the smith had a free hand. His art was unchecked, untrammelled, and uncontrolled, for there is no pretence that any of his work was designed by great masters, or by any one but himself. With a boundless demand for his work, that never seems to have slackened for 150 years, with a field to practise in extending from Alsatia to Poland and from Denmark to the Tyrol, with all the advantages of being able to transmit his traditions from father to son uninterruptedly for several generations, and among such diverse "*geists*" as Saxon and Swabian, Czech and Switzer, the art of the blacksmith in Germany had an opportunity almost unique of showing to what magnificent developments it could soar.

Fig. 82.—Part of Stair-Rail, Italian, produced with Scarcely any Welding (in the South Kensington Museum).

In following the development of German ironwork we must bear these extraordinarily favourable conditions in mind. Whenever we do this, however captivating the work may seem at first, the result as a whole is disappointing. The German smith's views were narrow, and whether for a palace or a church, the guest-chamber or the grave, his designs were the same. The same little jokes—as

knotting the moustache of a mannikin figure-head into a handle or knocker—were repeated thousands of times, and all his changes were rung on three leading themes.

FIG. 83.—GRILLE CLOSING THE VON GUSMANN CHAPEL, LÜBECK. DATED 1784.

We saw, last year, that the thistle was introduced as a *motif* into smithing at Cologne in the Gothic period, and that the pierced, seaweedy lock-plates designed from the thistle, and backed by red and blue paper, spread over all the country. It did not die out under the Renaissance, but its curving spinous leaves remained, to be fashioned into rich grilles formed entirely of intertwining scrolls on which these leaves were seated. Thousands of simple examples of this work still remain *in situ* in Germany, and others enrich our museums. I illustrate [fig. 83] a very grand one in the grille closing the Von Gusmann Chapel in Lübeck, dated as late as 1784. There are almost replicas of this existing in places so far apart as Denmark and Austria. A singular variety, equally based on the thistle, introduces a sham architectural perspective. This latter was a favourite treatment in Switzerland, and passed from thence to Austria, the grand specimen in the Augarten in Vienna being of the time of Charles VI.; while a still finer one is to be seen in the grille closing the presbytery of St. Stephan's Cathedral.

The second theme of the German smith was the passion-flower. Like the thistle, it was born in the Mediæval period, but flourished during the Renaissance, and was a favourite wherever the German language was spoken. Its origin seems to have been the ordinary twelfth-century iris, and it consisted of erect and recurved petals, sepals,

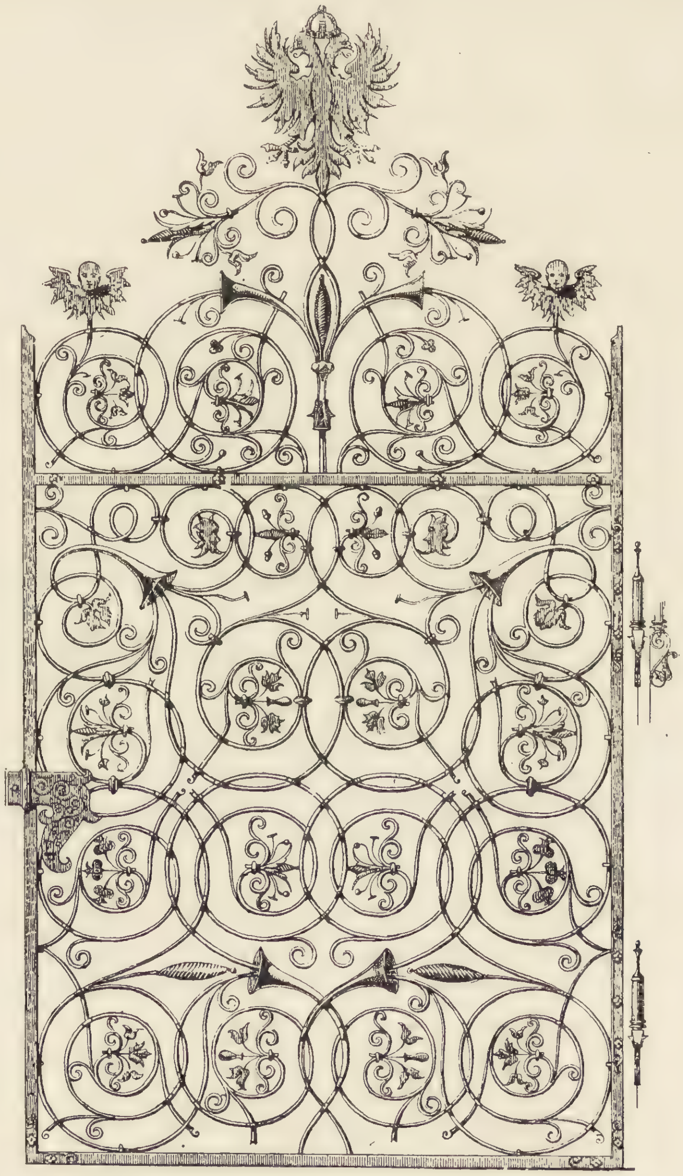

Fig. 84.—German Sixteenth-Century Grille in the Church of the Magdalen, Breslau.

and stamens. There was certainly at first no intentional reproduction, for the mystic *flos passionis,* though also a native of Asia, was introduced into Europe from the New World; but as the flower in German ironwork became increasingly richer, until six or more of each of its parts were worked in, a resemblance became strikingly apparent, and

must have been purposely heightened. The flower, as is well known, was believed to hold the crown of thorns, nails, and other emblems of the Passion. It is invariably combined with the third theme of the smith—the typical threaded work—which can be clearly traced back to the early French lattice grilles. There are fine examples, such as that dated 1641, from No. 21 Saalgasse, at Frankfort-on-Main. A screen by Hans Ruce, dated 1516, shows a far finer development of the flower; but the illustration [fig. 84] from Breslau gives its average development. After passing through relatively simple stages it became elaborated into absolutely bewildering complications. One of these, dated 1624, also from Frankfort, comprises about two hundred threadings; but the example [fig. 85] shows an even richer specimen, for as many as four hundred may be counted in this single grille. It is difficult to follow their mazy intricacies with the eye, and if it could be explained that they are not threaded like crochet, our

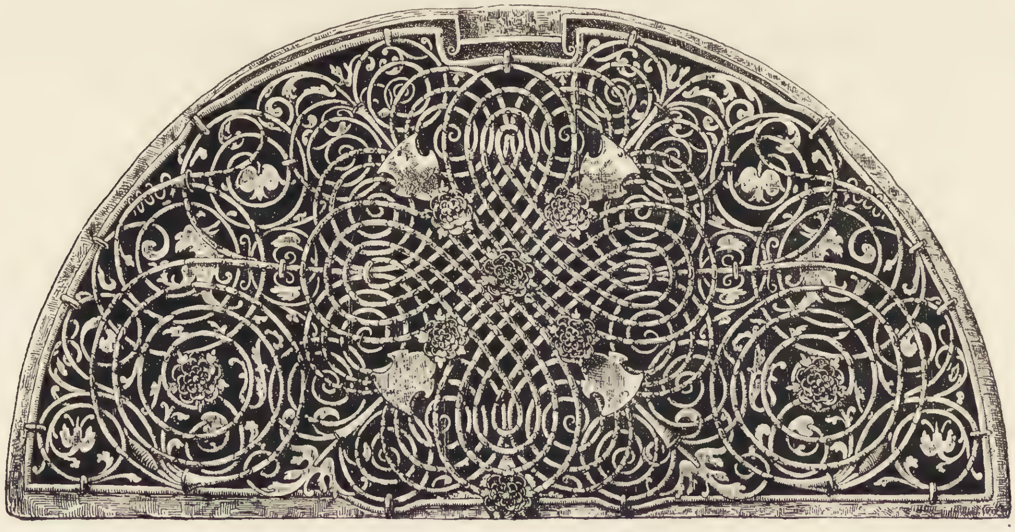

FIG. 85.—GERMAN DOOR-HEAD GRILLE OF THE SEVENTEENTH CENTURY, FROM BAYREUTH.

admiration for the *modus operandi* and the technical skill displayed would be unbounded. The loose ends were finished off in leaves and passion-flowers, or in grotesque heads, trumpets, and other quaint, but stock conceits. Such grilles were commonly used in buildings of any pretence, and they are still numerous. Frequently these threaded grilles were arranged in rectilinear patterns, with circles and other figures passing through the lines, a type which required even more skill to produce. Some of these can be seen on the market-place near the Dom, in Frankfort, dating from about 1624. The grandest specimens of threaded work are, however, to be found in the cathedrals and sumptuously endowed churches of Germany. Every visitor must have seen those at Innsbruck, Augsburg, Aix-la-Chapelle, Cologne, Coblenz, Ratisbon, Ulm, Prague, Brunswick, Breslau, Munich, Amberg, Würzburg, Marburg, Salzburg, Heidelberg, Nuremberg, &c. They range in time from at least as early as 1550 down to quite 1672. The well-cover from Schloss Grafenegg near Krems [fig. 86] shows

how effectively this work was used for other purposes in Austria. Sometimes sheathing

Fig. 86.—German Sixteenth-Century Well-Cover, from Schloss Grafenegg.

leaves, growing in the reverse direction, were introduced, a variety much used in grave

crosses and signs [fig. 87], and taken originally, it would appear, from an attempt to introduce the snail.

A fresh impetus was given to German smithing by the style called the Baroque in architecture, which introduced broken scrolls and endive-like acanthus leaves in ironwork: and again during the period of Lüdwigslüsts, when the German Louis Quinze work came into fashion and every "*jünker*" emulated the extravagances of Versailles.

I cannot quit German ironwork without referring to the contemporary locksmith's work. The designs for door furniture are far more varied and fantastic than for grille-work. It was mostly formed of sheet-iron, pierced, and embossed, and lined in with the graver, and lastly tinned. The most magnificent examples are those in which the entire door was covered with a diaper, rich in flowers and armorial bearings—a gorgeous treatment to which they seem to have been particularly partial in Eastern Austria and Poland. All those with an heraldic treatment are satisfactory, but, as a rule, other designs are intricate, mannered, and angular. Male busts or armed figures are used in preference to animal or female subjects, and the foliage introduced is thin and spiky. The surface was often ornamented by etching, gilding, oil-painting, or damascening. Another *tour de force* was the carving of even equestrian statuettes out of solid blocks of iron, practised by Gottfried Leygebe. The portrait of our Charles I., 1637, as St. George, now in the Green vaults at Dresden, took five years to accomplish. The throne belonging to Earl Radnor [fig. 88], presented by the Augsburg folk to Rudolph II., and made by Thomas Ruker in 1574, is carved in the same way out of the solid. The subject on the back is the dream of Nebuchadnezzar, and below are illustrations of events in Roman history.

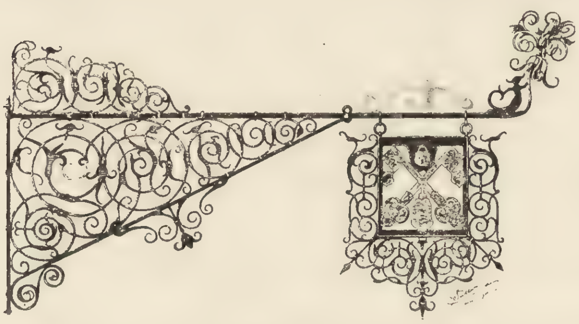

Fig. 87.—German Sixteenth Century Sign (in the Mayence Museum).

Proximity to the borders of the Low Countries is denoted by the quantity of Flemish ironwork to be seen in the churches and other buildings. Though the industry had only taken root there during the fourteenth century, its robust youth was over before the Classic revival had well begun to penetrate the country. The remarkable fact about Flemish ironworking is, indeed, the rapidity with which it placed itself abreast of that of the sister countries. There is no need to linger over it here, as little was made under the Renaissance beyond such things as wall-anchors, kitchen utensils, finials, and door furniture—all of which, perhaps, especially shutter-hinges and fastenings, have a quite peculiar style. Under their overshadowing neighbours, the French, particularly in the reign of Louis XV., the native art of the Netherlands became "*bourgeois*." Still, at one of the churches in Bruges a pair of gates made in Ostend in 1690, which can be seen behind the choir, are quite exceptional

in style. They show what probably might have become a Flemish style, but, as it is, they are merely interesting as an example of an arrested development. The guild and shop signs are numerous and remarkable, as, though consistently French in detail, they present an altogether Flemish rotundity of curve.

But that which will ever shed an undying lustre on Flemish ferric art is the fact that it is the parent stock of the magnificent Spanish school of ironwork. Though there had been a slight interpenetration of styles over the borders of France, Spain remained unconscious of the decorative possibilities of wrought-iron until the country had become impregnated with the art of the Netherlands. It then seems to have realised with a rush the great capabilities of the material, and how, if properly handled, it might be made to architecture what the crest is to the peacock. Spain first imported the Flemish grille or screen into its churches. The illustration [fig. 89] gives an interesting example of this style, from La Casa de las Conchas, a singularly well preserved mansion in the florid Burgundian style of the Low Countries. Next it took a bold step, adding crestings to the grilles [fig. 90] directly borrowed from some of those striking liliaceous plants—the aloe, agave, and yucca—recently acclimatised wonders from the New World. Next, the grilles were carried three storeys in height; and finally, the details were translated into the fine new plateresque, and the freest play afforded to the imagination. The new industry had, indeed, received an enthusiastic welcome, and never in its history had it fallen on so rich and virgin a soil. Spain was at the zenith of its power and riches, and its suddenly awakened smiths treated technical difficulties and cost with a disdain that has scarcely been paralleled elsewhere. The Spaniard was the first to recognise the real value of grilles and screens in cathedrals —the complete veil and the absolute protection; they were carried to a height which rendered the idea of scaling them too hazardous to be contemplated, and over which the eye could not be raised without an effort. Between the years 1500 and 1600 these colossal rejas were reared in almost every cathedral, not uncommonly to a

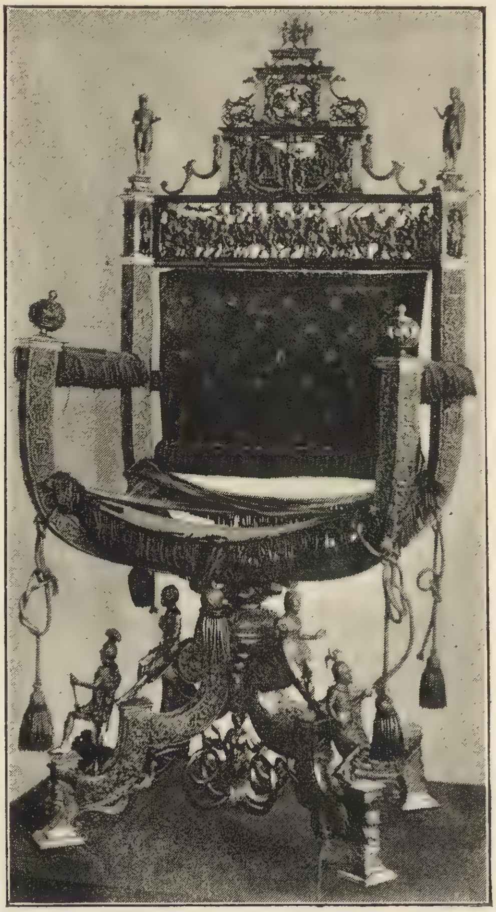

Fig. 88.—Throne of Chiselled Iron, by Thomas Ruker, 1574.

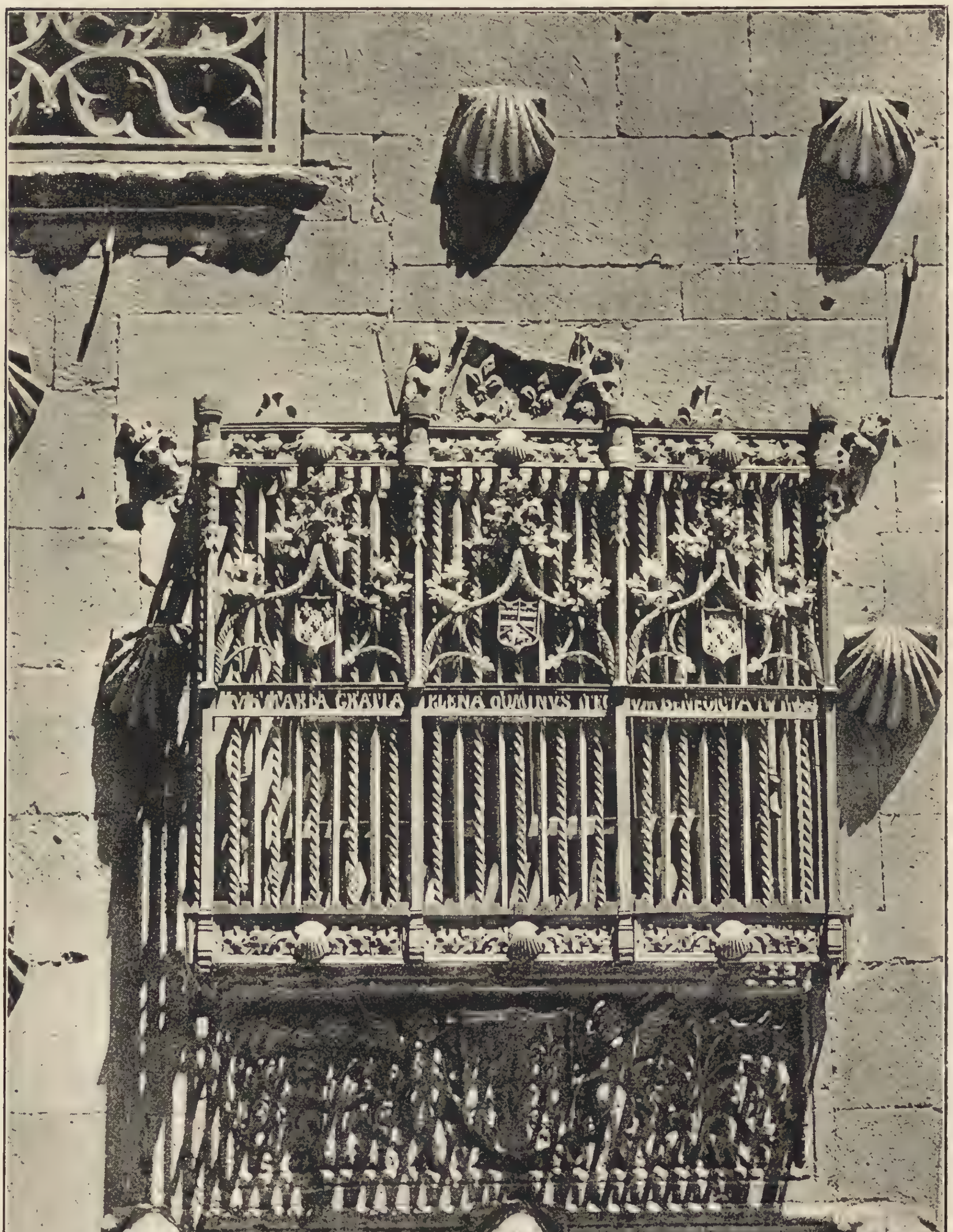

Fig. 89.—Window Grille to "La Casa de las Conchas," Salamanca.

Fig. 90. Grilles with Leafy Crestings in Barcelona Cathedral.

height of thirty feet and more. Great transparency and strength were given by dividing them into several tiers of long attenuated balusters, often carved into leaf-work out of the solid iron. These tiers were separated, especially towards the upper part, by deep bands of the richest imaginable scroll and arabesque work, from which Flamboyant detail has not wholly disappeared. Interwoven in these bands, and especially in the deep crestings with which the whole is crowned, are armorial bearings, and every kind of organic form, even busts, medallions, and groups of figures, nothing being too ambitious for the smith to attempt and achieve. A more massive effect is sometimes given to these sumptuous structures by pillars and cornices of wood cased with thin plates of embossed iron beaten into most exquisite Renaissance ornament. The whole was then polished, silvered, gilt, and painted. Pulpits, staircases, candelabra, and other objects were made *en suite*. The names of the artificers of these grilles have been handed down, and we find that many of them were in holy orders, and that even the most magnificent of the grilles were produced in the short space of ten years.

The grandest examples of the plateresque rejas are in the cathedrals of Toledo, Seville, Granada, and Palencia, but fine ones are to be met with in most of the other cathedrals of Spain, especially Plascencia, Pamplona, Salamanca, Saragossa, Leon, and Burgos. Our illustration [fig. 91] is taken from a photograph of one of the finest of these, enclosing the Coro of Seville Cathedral. It was made in 1519 by the iron-master Sancho Muñoz, a native of Cuenca. It is gilt, and, besides the fine ornament with which it is covered, it has figures of the kings and prophets representing the genealogy of Our Lord. The loftier and even more magnificent reja of the Capilla Mayor in the same cathedral is the work of the friar Francisco de Salamanca, 1518–1533. It is similar to the Reja del Coro [fig. 91], but has a deep band of rich figure-work and arabesque dividing it into two storeys at about twenty feet from the ground. The pillars are round and more slender, and the twisted bars are replaced by ranks of attenuated balusters. Fig. 92 represents the magnificent grilles closing the chapels of the Conception and the Annunciation at Seville, showing that this lavish work was by no means confined to the principal rejas. Fig. 93 shows the sumptuously decorated balustrade to the double staircase leading to the door of the north transept of Burgos Cathedral, which, owing to the slope of the ground, is thirty feet above the pavement level. It was designed by Diego de Siloe in the richest style of the Renaissance. The lofty reja in the same cathedral is a masterpiece of Christobale Andino, 1523, and is considered one of the best pieces of ironwork ever produced. Fig. 94 is part of a reja to a side chapel, and perhaps gives a better idea of the details of Spanish plateresque ironwork than the more complete examples figured.

Few specimens have hitherto left the country, but part of one from Avila is in the South Kensington Museum, where the beauty of its details can be studied; and in Chester Cathedral the choir aisles are closed by parts of grilles from a Spanish cloister acquired and presented by the Duke of Westminster. Kensington also possesses a pulpit stair-rail formed of cherubs; some rosette-like nails; and a pierced and damascened steel arm-chair, an example of the perfection to which the armourers, rather

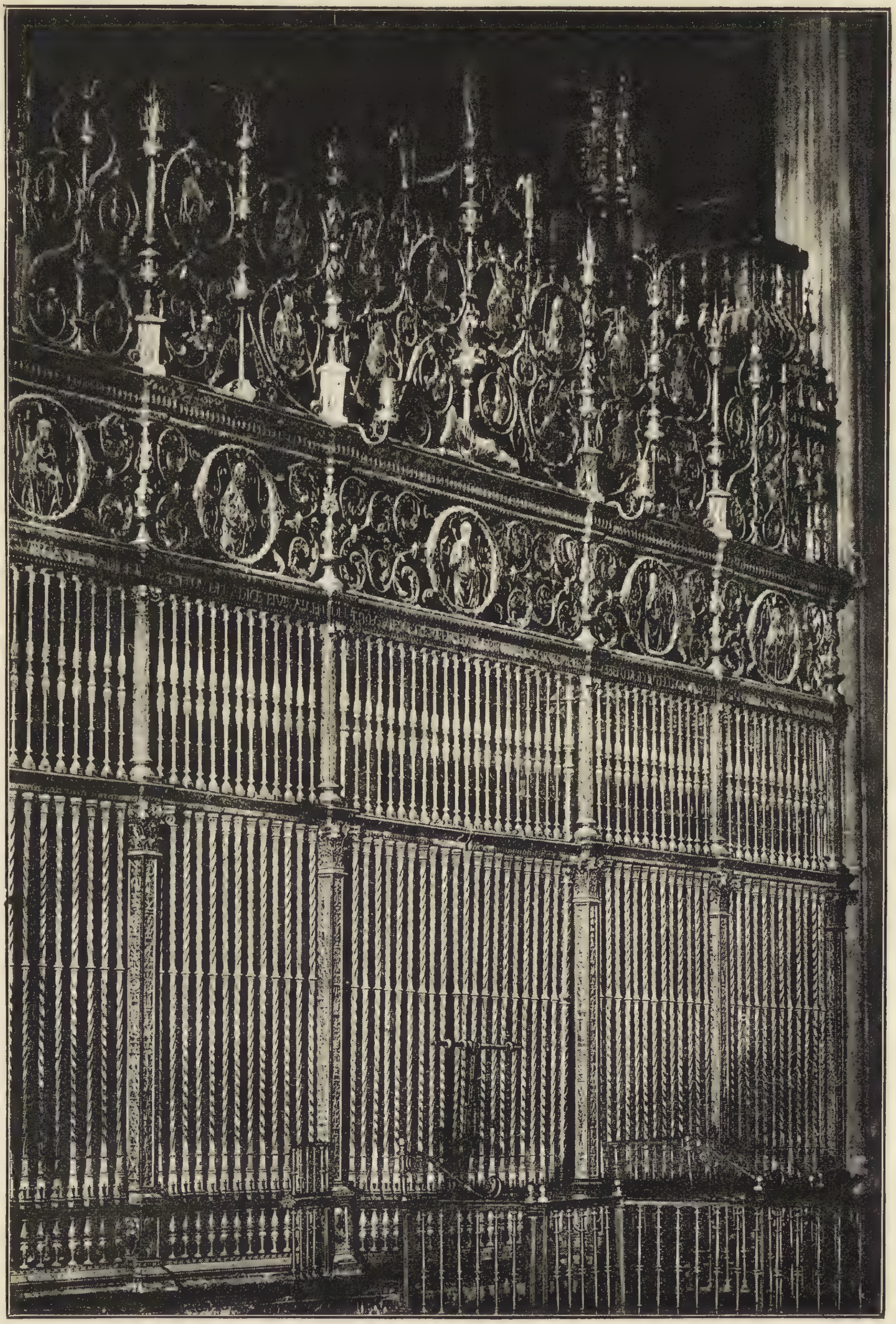

FIG. 91.—THE REJA DEL CORO, SEVILLE CATHEDRAL.

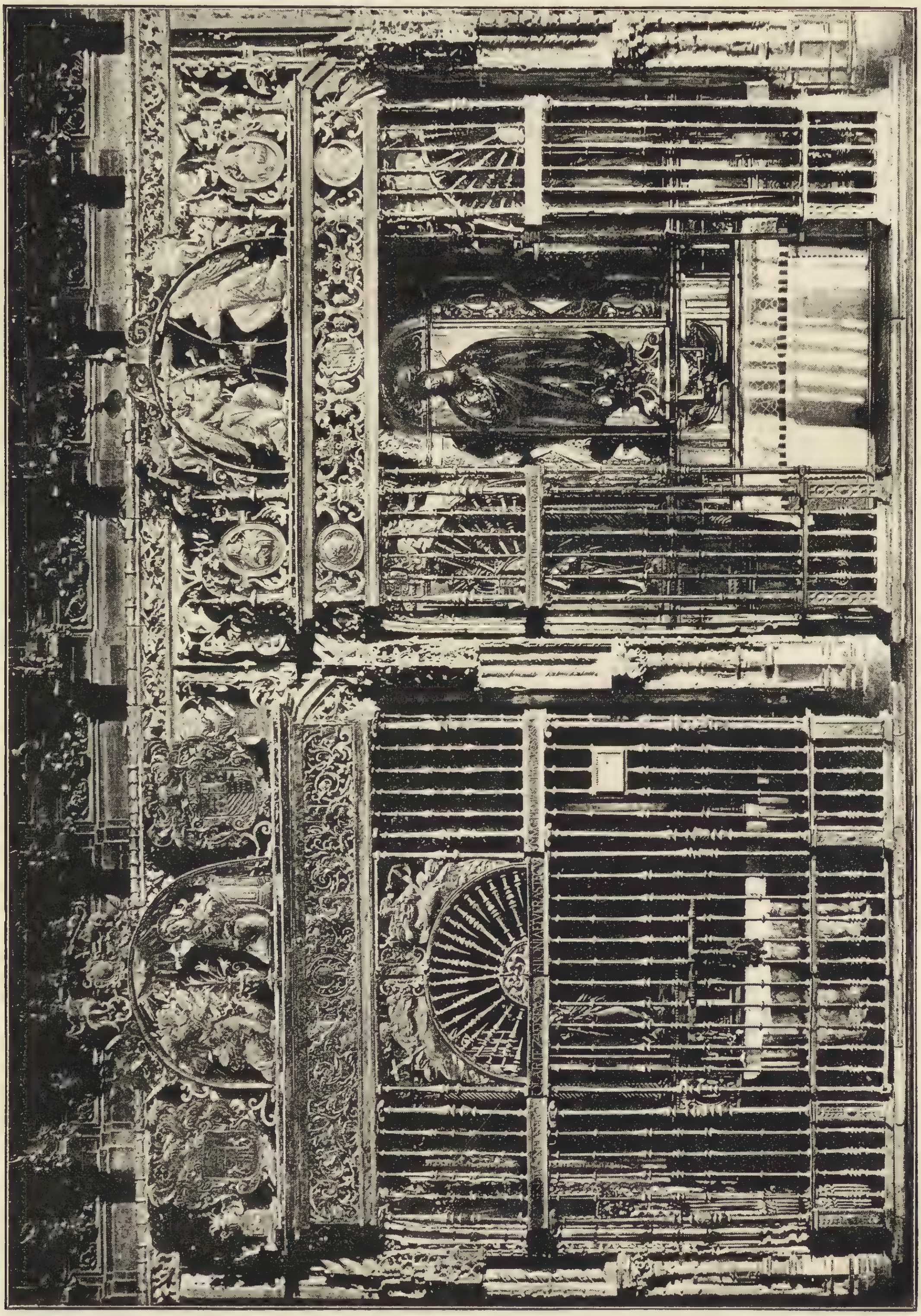

Fig. 92.—Grilles to the Chapels of the Conception and the Annunciation in Seville Cathedral.

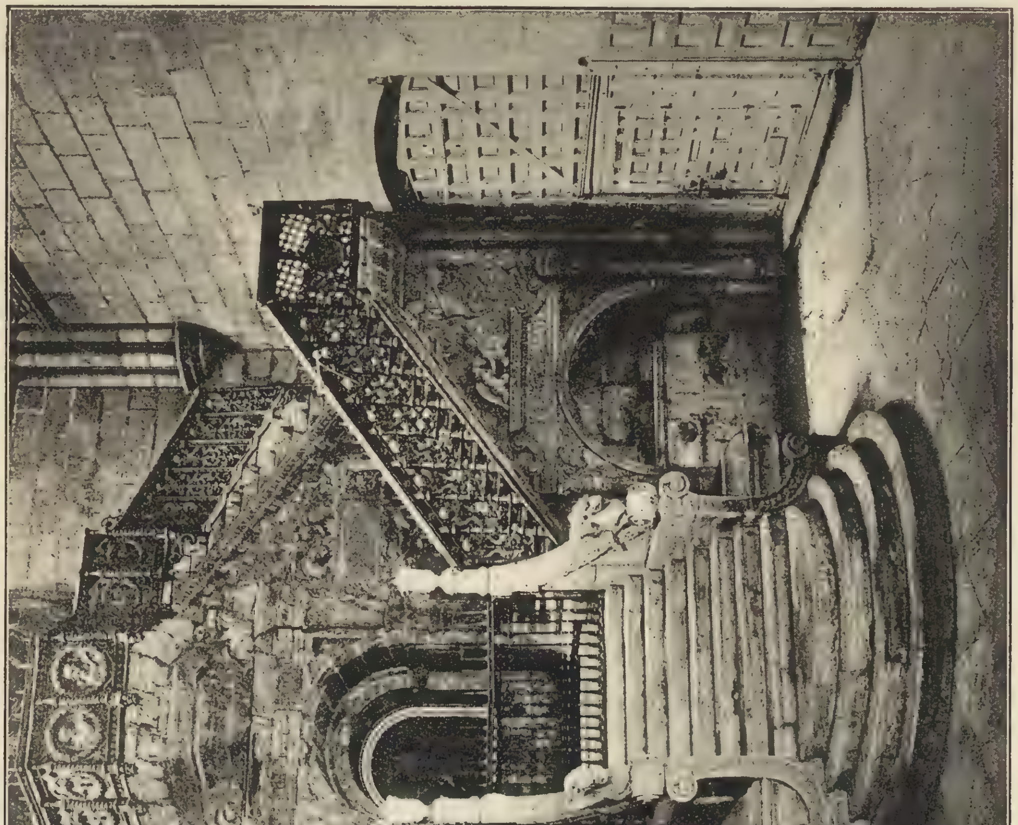

Fig. 93.—Stairs to the Puerta Alta de la Coroneria, Burgos Cathedral. Designed by Diego de Siloe.

than the smiths, had brought their craft. Though ironworking declined with the Baroque, no countries so abound with it at the present day as Spain and Portugal, where even the very vineyards are closed by gates of good design and work.

Sumptuous and grandiose as we see the Spanish sixteenth-century work to have been, we can yet turn from it with real pleasure to the art of France. For genuine refinement and almost poetry of design, France has rarely at any time been excelled; and it was during the introduction of Classic architecture, otherwise the Renaissance, that the ironwork had reached the highest point of delicacy and restrained richness. The fine pierced steel locks which enrich so many collections are simple in outline, but bear most beautifully chiselled figures and armorial bearings in high relief, on backgrounds of exquisitely proportioned flamboyant tracery, perfect in taste and finish, and contrasting strongly in such respects with the similar productions of other countries. So fine is some of the work lavished on the locks of chests and wardrobes, that more than a thousand pounds has been paid for a single specimen. These locks preserved their purely mediæval feeling and continued to be attached to doors and furniture long after almost all trace of it had departed from architecture and wood carving. Indeed, locks and keys of the utmost elaboration, and of debased Gothic design, continued to be produced down to the time of Louis XVI. The craft had reached a culminating point at the end of the mediæval period, beyond which real progress was impossible, and there was thus no field for any renaissance in ironwork; and the change was simply a transition from mediæval to classic detail, by which the ferric art of France actually lost rather than gained. The highly embossed lock covers of François I., beaten in relief from single sheets of iron, do not compare in sentiment or beauty with the

Fig. 94.—Some Details of a Spanish Reja.

chiselled and pierced locks of the old style which preceded and accompanied them. The new designs represent Corinthian porticoes with garlands, caryatides, draped figures, and combats, mingled with royal or other monograms and badges. The

FIG. 95. – PART OF THE POLISHED WROUGHT-IRON GATES TO THE "SALLE DES DESSINS" IN THE LOUVRE, *circa* 1658.

relief is so sharp and precise that it is difficult to realise, without handling them, that they are not castings. Most of the specimens, which are quite abundant in museums, seem to have come from a few royal or quasi-royal châteaux, such as Anet and Ecouen. The equally beautiful bolt cases are so common that hundreds of rooms

must have been provided with them. These were followed by the repoussé and damascened and polished iron clockcases, mirrors, flambeaux, purse-mounts, étui-cases, and the chased renaissance keys, which fetch more than their weight in gold. With more or less modifications, works of this kind were produced down to last century, rare pattern books even existing, such as that of Mathurin Jousse, 1627, and of Hugues Brisville, 1670. The grandest examples of this kind of work are, perhaps, the three iron gates and overgrilles made for the Château de Maisons, designed by François Mansard, 1658, and now in the Louvre. Those closing the Galerie d'Apollon are the best known to visitors, but the gates to the Salle des Dessins [fig. 95] are scarcely inferior in beauty. We must look on these, which, great as they are, are purely the work of the locksmith, as the closing works of the prolonged period of ironworking in France. It had reached its last expression, and it succumbed in great measure to an importation of fresher and less laboured locksmithery from England.

In the meantime there had been a renaissance—that is to say, the blacksmith had begun to practise his art again at the very bottom of the ladder. The first blacksmiths' grilles of the new series are as primitive as can be. One made for Henri II. is merely a set of rough parallelograms filled with the H. D. and crescent. Finials show a little more originality. It is only at the close of the sixteenth century, under Henri IV., that progress is visible, and that we begin to detect the unmistakable forms of a new school. Under Louis XIII. we have a fully developed style, with lyre-shaped balusters, scrolled balustrades and balconies, park gates with open-work pilasters and scrolled tops, sign-brackets, well-covers, &c., of quite modern aspect. Progress was rapid, and ironwork became a more and more indispensable feature in the châteaux of the great and the grounds surrounding them; until, under Louis XV., a second culminating point of the blacksmith's art was reached in France. We are astounded on visiting Nancy, for instance, to see the vast sums that must have been lavished by the ex-King of Poland in encouraging the celebrated smith Lamour. But we have only to enter almost any cathedral in France to realise the prodigious sums that must have been spent on high-class smiths' work under the rule of Louis XV., for there is scarcely one that was not supplied at that time with new choir and chapel grilles. The publications of Lamour, Fordrin, Cuvilliés, and many others, sufficiently show its public estimation, and that considerable individuality and diversity existed in style even in France; a diversity greatly accentuated as it spread across the borders in every direction to other countries, both far and near. The illustration [fig. 96] is from a small grille in private possession, interesting as having been made, it is supposed, for Chesterfield House.

The art of our own country is naturally the most valuable and interesting to us, though hitherto it seems to have received but little consideration in the arrangement of our museums. Unfortunately, whether interrupted by the Wars of the Roses, or for some other reason, the ferric art did not enjoy the same prolonged career in England that it did in France, and it has every appearance of having been prematurely arrested. It barely reached what I have described as middle age.

Whether such things were always rare with us, or whether Puritanism and, later, Vandalism made a clean sweep of everything movable out of our churches, sixteenth-century ironwork is only exceptionally to be seen. In Tanfield Church is a most valuable herse, a beautiful arrangement of standards carrying cressets, and supporting a canopy bearing other cressets of very refined design. There is a part of a herse, or more probably tomb rail, from Snarford Church, in the South Kensington Museum, of very interesting character. In St. George's Chapel, Windsor, is an English alms-box of the time apparently of Henry VII., consisting of a deep octagonal chest standing on four pillars and crowned with turrets. Door-hinges down to the first quarter of the seventeenth century were mere straps, or straps with twisted beadings and fleurs-de-lis ends. Highly decorative locks of native production are rare, but occasionally may be found. One illustrated by Pugin, from Beddington Manor, with the arms of Henry VIII., is as rich as the contemporary foreign work. Others are figured in various publications, and there is a splendid chest lock from Somerset in the South Kensington Museum. As a rule, however, our sixteenth-century locks and keys are very plain, yet with an interesting quaintness. We should know exceedingly little of our transition ironwork had it not been for the almost exclusively English practice of fencing in the funeral monuments in churches with iron rails. The series in our cathedrals is most valuable, as showing the state of ironworking in England, wherever restoration has not made a clean sweep of such work ; and some few churches, like St. Helen's, Bishopsgate, are still rich in specimens. We see by these examples that the originally excessive weight of the buttressed standards, bars, and cornices is lessened, and these architectural features almost disappear as we approach the sixteenth century. Lighter bars, closely set together, and ending in small spear-points, take their place. In many examples fleurs-de-lis ends are substituted. The standard bars terminate very richly, sometimes in large and boldly worked fleurs-de-lis, as in Bishop de Sheppey and Bishop de Merton's tomb in Rochester Cathedral. Others, as in many that formerly stood in Westminster Abbey, had the standards surmounted by the crests of the owners, like those of the Countess of Hertford, buried in 1598, and of Mary Stuart. Elizabeth's tomb had, in addition, a continuous range of roses and fleurs-de-lis along the top of the rails, and her initials " E. R., " with falcons and lions repeating on the frieze of the railing. The latest examples belonging to the old traditions consist of plain spiked bars, with plain or twisted standards surmounted by an open-work, twisted, or broad spike with a double scroll, or perhaps a leaf springing from each side. Good examples exist in old Chelsea Church, and such are often to be found in remote village churches, where they were used down to about 1700.

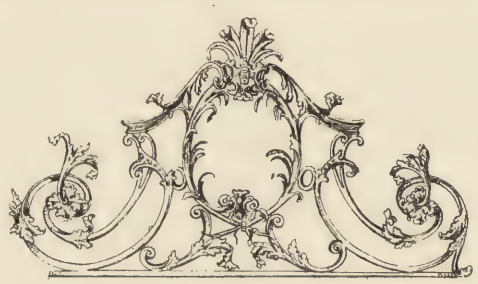

Fig. 96.—Louis XV. Cresting of a Gate (said to have been made for Chesterfield House).

The first expressions of a renaissance in English ironwork are difficult to separate

from the last productions of the dying industry, since the two overlapped each other. the new style, however, revels in British lions, oak leaves, and other national emblems. The hinges of St. Saviour's Church, Dartmouth, made in the first years of the reign of Charles I., with passant lions impaled on an oak tree, are splendid examples of the new art. They are very massive, beaten in high relief, with all the vigour of character we have over and over again seen denoting the introduction or revival of the art of smithing. But far more characteristic of youthful vigour are the massive wrought-iron columns, six inches in diameter, which support the gallery of the same church. These appear to be the largest forgings produced in Europe down to the introduction of steam hammers. Other oak-leaf hinges are recorded to have disappeared in recent years from a church in Dorsetshire. Oak leaves and acorns crop up in the terminations of railings, stanchion bars, hour-glass stands, &c., of the same date—that is, in pre-Cromwellian days. Together with these we find a very peculiar style of work, consisting of iron beaten thin, with the broad face on the vertical instead of the horizontal plane. We seem to meet with this for the first time in the tomb rail of Dean Wotton, 1566, in Canterbury Cathedral. The upright bars are surmounted by a range of arabesque ornament, while the standards end in a cluster of attenuated acanthus leaves. A cradle in the Ashmolean Museum, reputed to be that of Henry VI., is made of flat scroll-work, and would, of course, if authenticated, be a still earlier specimen. A remarkably early hour-glass stand in Leigh Church, dated 1597, is made of similar strap-work, with a sort of wheel arabesque design; and there is a curious reading-desk of the same work at Clyffe Pypard, which cannot be much later. The unique bracket, with prickets, of Rowlstone, in Herefordshire, is somewhat of the same category. One of the most important examples of this work in England is, however, in Farley Castle, where the gates closing the Hungerford Chapel [fig. 97], erected about 1650, are entirely of this kind of strap-work, and show that rich designs on a large scale could be fashioned from it. A more striking and splendid specimen of the same class is the wrought-iron and gilded baldachin over the recumbent figures of the Duke and Duchess of Richmond and Lennox in Westminster Abbey, dating from the last year of the reign of James I. Another interesting example comes from remote Holyrood, and must date from about 1670. The design is very bold, and in it the Scottish thistle replaces the English emblems. There is a great variety of locks, casement fastenings, handles, &c., belonging to this group of work, showing some originality of design, and it is hardly necessary to mention that all the well known Jacobean cock's-head and H hinges fall into it.

It is quite possible that the gates formed of long, plain, or twisted bars, ending in flattened spikes to which a flattened C-scroll has been welded on either side, link the flat work with that which had preceded it, as well as with that which was to follow. There are examples of these in Cirencester and in Hereford, and the heads alone are often used as crestings or in panels for framed timber gates, as in the Middle Temple Hall. A very fine example of a partly timber and partly iron grille of this description closes in the Warburton Chapel in St. John's Church, Chester. This is rendered still more interesting by the introduction of flat scalloped roses with multitudinous

petals and some edgeway scrolls. These latter features are combined in a great deal of the ironwork of our city churches. Two lamp chains are preserved in the Kensington Museum which, if not from St. Catherine Cree, are of the same design, and there are others in St. Paul's Cathedral, which retain the flat work in their trident points, together with the multi-petaliferous rose and a curious crinkled sort of water-leaf, in the hollow of which we find that corkscrew spirals were invariably laid. Another example in South Kensington Museum is either the font-cover bracket of St. Michael's, Queenhithe, figured by Mr. Niven, or one like it.* The best specimens, however, of this work are the sword and mace rests, a fine group of which exists in Allhallows, Lombard Street, while isolated specimens are common in other churches, as St. Stephen's, Coleman Street, &c. It is a remarkable style, which might have had a great extension had it not been entirely arrested and exterminated by a more vigorous competitor. This competitor really belongs more to modern than to Renaissance times. It is the progenitor of the Queen Anne ironwork so familiar to every one, and its gradual development can be traced on many a tomb rail, gate, and screen about the country. Time does not permit of its evolution being laid before you in any detail, but it must have been quite completed by 1666, if the date worked in the gates to Bromley College is to be trusted. It is satisfactory to know that, though doubtless influenced by French smith work in its first conception, it is otherwise a purely English growth, owing nothing at least to Dutch or Italian art.

Fig. 97.—Gates in the Hungerford Chapel, Farley Castle.

This style in its turn ran considerable risk of being displaced when the great French smith Tijou settled in this country, and was commissioned to make the lion gates, the screens, and other work at Hampton Court, erroneously attributed to Huntingdon Shaw. These were all made, and drawings of them published, in 1693.

* The original bracket seems more probably the one in the triforium of St. Paul's Cathedral, where it is hidden from public view with much other fine iron- and wood-work, which might, perhaps, without inconvenience be loaned for a period to the South Kensington Museum.—J. S. G.

This and other commissions were apparently followed by one for the magnificent gates, screens, &c., closing the choir and aisles of St. Paul's, in which the English influence is even more sensibly felt than in the Hampton Court specimens. Tijou's work is far richer and more florid than that which was then being executed in England; but instead of permanently changing our style, its influence, though great at the time, passed away and was absorbed, leaving our designs of the end of the reign of Queen Anne very much what they were under Charles II.

It only remains to mention some of the English locksmithing, which, as already incidentally mentioned, almost completely put an end to that industry, as a fine art, in France. The keys belong to several types of lock, among them one in the Architectural Museum ornamented with pierced flower-work, such as roses, pinks, tulips, &c. One of the handsomest keys in the South Kensington Museum bears the arms of Baron Stawel, of Somerton, and must have been made about the year 1690. Another most beautiful specimen fits a lock made by Johannes Wilkes of Birmingham, and is, perhaps, of somewhat later date. Specimens of similar keys abound in every collection in France, many being of still more beautiful design. One of the most delicate that can be imagined, with finely pierced barrel, and containing the cipher "Maria Regina," is in the possession of Mr. George Truefitt. It is work we may well feel proud of, and glad to have generally recognised as English; while it is not a little interesting to find that Birmingham has been able in the past not only to hold its own, but actually to have annihilated by its superior merit an industry which in most conservative France had reached a stage of great magnificence. Birmingham repeated this triumph in its cut steel-work, when steel watch-guard chains were manufactured to sell for as much as 80*l.* each.

In conclusion, Gentlemen, let me add that the story of ironworking never has been written, and therefore cannot be learned from books. Though now so little visible in architecture proper, we can hardly help feeling that a material out of which constructions a thousand feet in height have been reared, and which would permit us to make roofs with a span of a third of a mile, if we pleased, is destined to be a great factor in the future, perhaps even to enable us to set the vicissitudes of climate and temperature, from which we are now obliged to suffer, almost completely at defiance.

J. Starkie Gardner.

ABSTRACT OF THE DISCUSSION.

Mr. H. H. STATHAM (*F.*) said that the Paper suggested to him one or two ideas. One was the absolute mistake committed when a realistic imitation of foliage was introduced into wrought-ironwork. The other was, considering that a good many of the examples were based upon certain vegetable forms—which were properly conventionalised, and in which there was no sort of objection in point of taste

—that, after all, very few of the available forms of Nature had been used as a basis for wrought-iron designs; and he thought that a very large field lay open to them for new treatment in wrought-iron, and for a far greater variety of design than at present existed. Modern taste in wrought-iron was very much purified—very much better than it was. But they were waiting for something new, and those who had a talent for designing and executing wrought-ironwork had better turn their attention not only to excellence of execution and purity of taste, but to the effort after something new and original, in addition to the stock forms of wrought-iron which they saw at present.

Professor AITCHISON, A.R.A. (*V.-P.*) thought that Mr. Gardner's specimens of Spanish ironwork were the finest of any ironwork he had seen. There was, doubtless, a peculiar charm about work roughly done on the spur of the moment, like the glasswork of Murano, but it only harmonised with other rough offhand work; and if its surroundings were characterised by great taste and refinement, they wanted crystal glass of perfect water and shape, enriched by delicate engraving. The Spanish ironwork met the latter requirements, and harmonised with the refined graces of Renaissance architecture. Why should not ironwork now be turned, chased, burnished, and damascened or gilt, like the armour in the armoury at Madrid, if it were wanted to harmonise with cultured surroundings? Although the work of Louis Seize was not beautiful in itself, still the way in which it had been treated by some of the ironworkers was remarkable. There was an iron screen in one of the churches at Munich which was the most wonderful instance of delicate wrought-ironwork that he had ever seen. Men of the present day were no doubt like the Athenians—ever looking for something new; and it was the characteristic of every generation that it wanted something different from that which had gone before. But the thing wanted was to get ironwork properly treated, with such slight variety as the taste of the day might call for. Iron had one great peculiarity which was particularly valuable at the present time. No doubt architecture would take a new development, and that development might possibly take place in the moulding of the material to the shapes that the strains indicate. Iron being a costly material, they were now obliged to give it the shapes that it should have to meet the strains, only at present no architect had been fortunate enough to put those forms into an architectural shape, or to ornament them characteristically. There certainly appeared to be a vast field for the exercise of invention in the application of new and appropriate shapes of ornament.

Mr. J. HUNTER DONALDSON said that as he had been through Switzerland and Italy quite lately, Mr. Starkie Gardner had asked him to bring back photographs of ironwork which would be likely to be of interest and not generally known. He went into numberless photographic shops in all directions, and was very much surprised to find that in towns where there was some of the most beautiful ironwork no photographic examples could be obtained. That seemed to point to a want of appreciation altogether on the part of the people living in those towns, and of the Italians generally, in relation to the work. It would be difficult to tell into how many places he went—how many inquiries he made—with a view of obtaining photographs

of the lovely works which he saw in all directions. Almost the only town in which he found any photographs at all worth notice of the beautiful objects to be seen was Siena; and certainly Signor Lombardi had produced, and had now always on sale for those who went there, very numerous examples of the magnificent ironwork in that city. There were also a few such photographs to be found in Florence and Genoa. But it was a very remarkable thing that both in Switzerland and Italy—in Italy especially, where one would expect people to appreciate the beauty of such works—everything else could be found in the way of photography except representations of ironwork. He asked the men, "Why has not this lovely gate, or this beautiful "bracket, or this fine chandelier, and so on, been copied?" The reply was, "There "has been no demand for it." In all the towns through which he went he found the same indifference to that beautiful art, and the same want of appreciation altogether of the lovely things in connection with it which they had before their eyes every day.

Mr. J. STARKIE GARDNER replied that he was quite alive to the endless forms which Nature provided as hints in designing ironwork. But, practically, and as a matter of every-day expediency, one had more or less to follow the styles of ironwork that were recognised. Very few buildings would, he thought, admit of entirely fresh treatment—entirely fresh departures in their ironwork. They had to be more or less assimilated to the styles and periods in which architects were working. It was a very curious thing that the Germans, although they had published scores of works on wrought-ironwork, seemed to neglect some of their most important pieces; and some of the grandest objects in Germany had never been illustrated in any of those albums that were so copiously produced just now. He was greatly indebted to Mr. Donaldson, who was more successful in procuring photographs from Italy than he appeared willing to admit. Italian ironwork had to be searched for. There were no publications, no books about it, and one could only pick up single photographs here and there, just as Mr. Donaldson or any other visitor might do.

XCVII.

THE INTERNAL ILLUMINATION OF BUILDINGS.

By Mr. W. H. Preece, F.R.S.

Mr. J. Macvicar Anderson, *President,* in the Chair.

Mr. President and Gentlemen,—

THE internal illumination of buildings by electricity will be an art in the future; it has not been an art in the past. It is but just born, and its rudiments have not yet been formulated. Electricity has only just stepped in as the purveyor of an artificial source of light approaching in perfection that of daylight, and free from those disturbing elements of smell, heat, and poison which have hitherto made our modes of internal illumination necessary evils, and our nightly resorts springs of disease. Our theatres have now been made bearable. Our houses have been made healthier, our comforts have been increased, our tastes are being elevated. The architect finds that he is face to face with new conditions, and he has asked the electrician to come forward and help solve some of the difficulties of the problem set before him.

The torch, "the flaming flambeau," was perhaps man's first source of artificial light. "The pine tree's withered branch" fired by some discharge of Nature's wild artillery may have been electricity's first lesson in the means of artificial illumination. We read in the *Odyssey,* Book XVIII., "Dark evening came on them at their pastime. "Anon they set up three braziers in the halls, to give them light, and on these they "laid firewood all around, faggots seasoned long since and sere, and new split with the "axe, and to them they set burning pine-brands. And the maids of Odysseus, of the "hardy heart, in turn were rousing the light of the flames" . . . "Odysseus took "his stand by the burning braziers, tending the lights, and gazed on all the men."

History is silent as to the origin of the use of tallow, pitch, wax, and oil, but gas as an illuminant came in with the present century, and the present generation has witnessed the growth of electricity's later developments. The present generation is in fact being spoilt by Science. It has been taught to annihilate space and time, to travel by

steam, to write and speak by lightning, to paint with the sunbeam, and to turn night into day.

We know very little of the modes of internal illumination of the ancients. The golden candlestick provided for the Tabernacle, with all its accessories, is minutely specified in Exodus (xxv. 31 *et seq.*), and even at the present day its form is evident on the Arch of Titus in Rome as one of the trophies brought by that hero from Judæa.

A custom in all ages prevalent in the East was that of keeping a light burning in the house throughout the night, and its extinction was regarded as a calamity (Job xxi. 17); but the Easterns went to rest with the sun and rose with the lark, and lamps and torches were used principally as pilot lights to show the way. The Northerns, having less daylight, were forced to relieve their long winter nights by burning tallow or oil. Excavation has brought to our knowledge many a beautiful Greek and Roman lamp worked in bronze and earthenware, and we are quite familiar with candelabra and lamp-stands of bold design and finished workmanship, while the old masters have depicted on canvas the modes of lighting adopted in the middle ages, and early prints show how our forefathers feasted and revelled in dim religious light. Olaus Magnus, Archbishop of Upsala, in his History of the Northern Nations, published in Rome 1555, has a chapter (xvii.) on lights and pine torches, in which, after speaking of whale-blubber as being largely used, describes and illustrates by a quaint woodcut [fig. 98] a sort of small torch made of pitch pine, several of which were stuck in the girdle, but the one in use was held in the mouth by the unlighted end like a gigantic cigar, leaving both hands free for work. Tintoretto, in his great picture of the Marriage of Cana, regardless of truth, shows a large hall apparently brilliantly illuminated by eight flaring dips. The Dutch painters teach us that one candle had marvellous gifts, and Hogarth shows how in his day our great-grandfathers were getting quite extravagant in the number of candles consumed. In Shakespeare's days plays were performed in daylight, and no roof protected the auditorium. Boswell refers to the light and smell of the flambeaux in the theatres of his day; and a well-known living actor, Mr. Henry Howe, speaks of the footlights of his early days on the stage, which were oil lamps, "and if one of them went out or smoked, a footman would "step in front of the stage—quite unheeding the death agonies of Macbeth—and set "matters right." Now in these highly favoured days every grade of light, every tone of colour, every strength of ray can be shed everywhere and anywhere upon the stage by the

Fig. 98.—Scandinavian Torch.
(From a woodcut of the sixteenth century.)

mere manipulation of a handle at the wings or beneath the stage regulating and directing the electric current. Messrs. Siemens's illustrative theatre at the Crystal Palace is a charming study in red, white, and blue, reproducing realistic effects upon the stage that are startling in their mimicry of Nature.

Light, by whatever means generated, follows the same laws. It is due to the rapid rhythmic undulations of the medium called *ether* that fills all space. Take a flint and a steel, strike them rapidly together, sparks fly and become visible; the energy of the arm has been arrested at the surface of contact, and its motion has been transferred to the molecular motion of the flying particles. They in consequence become heated, their temperature becomes very high, and they throw the ether into innumerable waves, impinging on the retina of the eye at the rate of many millions per second, and impressing on the brain that sensation which we call *light*. Motion is thus the cause of light, and heat is the source. Wherever there is light there is always heat, though in the shining glow-worm and the phosphorescent summer sea no trace of warmth is evident. The hope of the philosopher is to supply light without heat, but at present it is but a dream. There is a widespread impression that the electric light is a cold light, but the touch of the hand on the smallest incandescent lamp that glows will at once dispel that notion. The delusion arises from the fact that the early arc lamps shed bluish rays of light which gave artistically a cold or chilly sense of colour. We cannot at present produce light without heat, and the higher the temperature the brighter the light. Colour changes with the rate of vibration of the ether. A temperature of just 1000° Fahr. imparted to any form of matter, especially carbon particles, enables them to undulate the ether at the rate of 400 billion times per second, which exciting the optic nerve give the sensation of dull red light. A higher temperature and a greater number of vibrations give orange, then yellow, then green, blue indigo, and finally violet. White light is a combination of all these colours, and changes of colour are due simply to the changes of wave motion of the ether. Light may become so intense that we lose all sense of colour, and very bright illumination may cause all colours to appear whitish. Hence the "chilly" effect of the arc lamp—the intensest source of light we possess.

If light emanates from a point, its intensity diminishes with the square of the distance. The flame of a No. 6 sperm candle which burns away at the rate of 120 grs. per hour will, if it be the only source of light, at the distance of one foot, give upon a surface of white paper, say a disc of one square inch, an amount of illumination which is our practical standard. The candle is the British standard source of light, defined, in fact, by Act of Parliament, and the bright surface is the standard illumination by which we can measure the amount of light we distribute. I call this standard of illumination a *lux*; it is about the mean illumination we desire on paper to enable us to read small print with ease and comfort. A British standard candle at six inches will give four luces, at two feet half a lux. A street gas-lamp in Conduit Street will give on the pavement at the foot of its post about one-tenth of a lux, while in the centre of the road between the lamp-posts it will give only one-fiftieth. A sixteen-candle

power glow lamp is a lamp which gives a light equal to that of sixteen British standard candles concentrated on one spot, and it will at a distance of four feet give the illumination of a lux. Thus one-candle power at one foot, four candles at two feet, nine candles at three feet, sixteen candles at four feet, twenty-five candles at five feet, give exactly the same illumination, viz., one lux on the paper on which we write or on the page from which we read. The problem set before us is to diffuse light throughout a room so that it shall be uniformly distributed over our working surfaces with an intensity of a lux. Sixteen-candle glow lamps suspended eight feet above the floor and fixed in eight-feet squares do this very well. A group of four such lamps fixed sixteen feet high do the same thing. Hence the practice has arisen to use ten-candle power lamps for reading and portable purposes, and sixteen-candle power, grouped or single, for general illumination. Twenty-five, fifty, one hundred and higher candle power lamps are found practically not so economical or efficient as groups of smaller lamps.

We owe the light a lamp gives to the expenditure of energy in its carbon filament. An electric current is driven through this filament by electric pressure, its resistance to this operation is overcome, it is thrown into violent motion, it is intensely heated by the proceeding, and the consequence is pure, unadulterated light which we can make as intense as we please, until, in fact, the texture of the filament is overcome, and it is dissipated by the violent agitation of its molecules. The energy expended per second by an *ampere* (our standard current) driven by a *volt* (our standard pressure) is called a *watt*. Three watts can be made to give the light of one candle, and therefore sixteen candles require forty-eight watts ; 746 watts are a horse-power, and therefore the expenditure of a horse-power will give us 249 candles. Now it is the general custom to distribute electrical energy in our streets at a pressure of 100 volts, and as the power expended in the lamp is the product of the volts and amperes, it follows that 100 volts and ·48 ampere or 48 watts give us sixteen candles. As a matter of fact, the lamps of the present day are best worked, for durability and economy, at four watts per candle, and therefore a sixteen-candle glow lamp actually takes sixty-four watts. Now, since we assume our sixteen-candle power lamps to be fixed eight feet high, it means that we require *one watt per square foot of surface* to secure ample illumination from lamps so fixed. This, therefore, is the common rule I follow in designing the normal illumination of rooms :—I take the floor area in square feet, divide it by sixty-four ; this gives me the number of sixteen-candle power lamps required, and these have to be increased or diminished according to the purposes to which the room is applied, its form, its height, and the style of its decorations.

If a sixteen-candle power lamp be alight on the average one hour a day for 300 days a year, it expends 64×300 or 19,200 watt-hours per annum ; and if our energy is sold at 8*d*. per 1,000 watt-hours, which is the Board of Trade unit, it means that such a lamp consumes 19·2 units and costs 12*s*. 10*d*. per annum. It is therefore very easy for consumers to check their Electricity bills, and to control the expenditure of electrical energy in their premises.

The eye, like all animal organs, is a very wonderful instrument. Its adaptability to nearly every degree of light is not its least striking feature. The iris opens and closes automatically with the increase and diminution of light, so that in some animals sight is possible almost in the dark, while others may look proudly at the sun. Man's range is very great. The consequence is that it is almost impossible for the eye to judge accurately of the amount of light present. Our fathers were just as content with the light emitted by two mould-candles that required periodical snuffing, as we are with thirty-candle power developed by burning oil or gas, or with sixty-four-candle power produced by electrical energy. If rapid transition be made from gas-lighted rooms to electrically-lighted rooms, the difference is perceptible ; but if the eye is allowed to rest in either, its great adaptability to circumstances renders each system apparently equally practical.

It is not as a mere source of light that the glow lamp is superior to a gas-burner. You can get as much light from gas as from electricity, but the glow lamp can be put where you want it, and it can be used when you want it without the adventitious aid of match or of fire. It does not vitiate nor unnecessarily warm the air we breathe. It simplifies the problem of ventilation. The quality of the light approaches more that of daylight, and it develops colour with greater accuracy. Electricity cannot be adulterated. It does not dirty or deteriorate our ornaments, curtains, or books. It lends itself above all to the satisfaction of the educated eye with the æsthetic harmony of our furniture, decorations, and domestic surroundings.

And why should not the eye, even in our humblest homes, repose for the greater part of its existence on that which is simple and tasty, rather than on that which is rigid and bare ? We cannot all attain the beautiful, we cannot even define what it is, but we can all appreciate the harmonious congruity of parts and the symmetry of a well-designed whole.

In the exquisite climate of Southern Italy the rich Roman using diffused sunlight employed the Greek artist to make his home beautiful with the brush, and the chisel, and the work of the foundry. The excavations of Pompeii show that this artistic feeling extended throughout every sphere of life. There can be no doubt that acquaintance with and the cultivation of the beautiful have an elevating influence on the simplest mind and a soothing effect on every intellect.

There is a widespread idea that the electric light is absolutely safe ; unfortunately it is not so. The transmission of energy, in whatever form it may assume, must ultimately become heat, and such an active form as that of the electric current is singularly liable to take the character of sparks if it fly across air, or intense heat if it pass through a short material line of high resistance. Electricity is ever ready to kiss its mother earth, and in doing so to produce fire at the point of contact. Hence the principal effort of the electrician is to keep the electric current in its assigned path, to insulate it from possible contact with other conductors or with the earth, to facilitate its flow and to prevent its escape. Security is obtained only by good design, perfect materials, first-class workmanship, and rigid inspection. Imperfect materials

hastily erected without supervision by dishonest cheap-jack contractors have led to many disasters. On the other hand, I have been assured by the responsible officers of the insurance companies that there has never been an instance of fire in buildings in this country fitted up under their rules and regulations and inspected by their officers. No work should be done except under a proper specification. Time will not permit me this evening to dwell upon the various clauses of such a specification. I give as an appendix one of the most recent that I have issued.

I am a great advocate for keeping everything as much as possible in view, and not hiding the conductors behind wainscots, under floors, and above ceilings. This secures not only daily supervision, but prevents the depredations of rats and mice. The channels, casings, tubes which carry the insulated conductors, can always be made to form part of the decorations of a room, and they can be supplied of a waterproof and non-inflammable character. Moisture is the great enemy of the electrical engineer.

Our goal should be, as a rule, to obtain in our rooms the effect of soft daylight. Mr. Hamo Thornycroft, R.A., has well defined the desideratum of the artist to be the reproduction of the sort of light which, reflected from some great mountain of white cloud in the northern sky, enters our windows so as to illuminate and show the just proportions of all objects on which it falls in their proper colours and harmonies. The lamp at our disposal is the glow lamp, and such a lamp excited by three watts per candle is at the present moment the most perfect source of domestic light we possess. Unfortunately, the tyranny of the patent law maintains the price of these lamps so high that it is not economy to burn them at that rate; but when the patent expires, as it will do in a year or two, we shall get them for one-third the present price, and we shall be able to afford to use a better light.

Now, how are we to distribute our lamps about our rooms so as to supply our wants without offending our eyes?

Lord Beaconsfield had evidently given much consideration to this subject. This is what he said in *Lothair* on the subject of house-lighting:—"Belmont is the only "house I know that is properly lighted. I would not visit any one who had gas in "his house; but even in palaces I find lamps; it is too dreadful. When they came "here first there was an immense chandelier suspended in each of these rooms, "pulling down the ceilings, dwarfing the apartments, leaving the guests all in dark-"ness, and throwing all the light on the roof. The chandelier is the great abomina-"tion of furniture; it makes the noble apartment look small. And then they say "you cannot light the room without chandeliers! Look at these: need anything be "more brilliant? And all the light in the right place: on those who are in the "chamber. All light should come from the side of a room, and if you choose to have "candelabra like those, you can always secure sufficient."

It is scarcely fair to say that all light should come from the side of a room. The House of Commons is one of the best lighted chambers in London, and that is lighted entirely from the roof—a ground-glass ceiling excludes the heat and the glare, and

admits only the light. A billiard-room generally lighted from the ceiling by day should equally be lighted from the ceiling by night.

What we want to avoid is the glare of the incandescent filament in our eyes, and to prevent the lamp itself from being obtrusive. It must do its work without inflicting upon us its presence. If it must be present, we must make it as pretty and as harmless as we can without impeding its effect. I venture to think that if Lothair's drawing-room, which of course was lofty, had been illuminated by brilliant glow lamps encased in the finest and best designed cut-glass globes, suspended by simple silk cords near to the ceiling, the last sentence I have quoted would not have been written.

We do not want to look at the incandescent lamp fibre. If the lamp be fixed high up we need not do so; if it be fixed low down it must be shaded from the eye. But it can be shaded from the eye without its effectiveness being destroyed.

We should not obstruct the flow or deteriorate the quality of the light. It is astonishing how the attempts to tone the rays down rob us of effective light. If we have a lamp giving 100 candles through clear glass, frosted glass gives 60; opal glass gives 70; cut-glass gives 90.

Moreover, frosting and opalling absorb the finer vibrations that give the silvery brightness of the light, and reduce the colour towards the orange grade. It is very striking at the Crystal Palace to see how Osler's cut-glass globes give the impression of sparkling jewels, while the pure unadulterated clear globe shines brilliantly among its shaded companions like a diamond in the sky.

It is a common thing to see a brilliant light encased in a ground-glass globe or enveloped in a bag, perhaps festooned with a study in green and brown silk, and reduced from sixteen candles to *one*. This may be domestic æsthetics, it is not domestic economy. The electricity bill mounts up, and comparisons with previous bills produce false impressions.

I notice at the Crystal Palace that several of the leading firms have not exhibited, and at the present moment it contains a very fine display of what to use and what to avoid in electric light fittings. There is very much there to avoid. Most of the things displayed are garish and vulgar, and many fittings are traps to catch the unwary. The electric-light fitter, to judge from this Exhibition, does not appear to have advanced much upon the gasfitter. He has not seized upon the spirit of the age.

The spirit of the present age is the rule of science over mere æstheticism. We span our estuaries in the clouds with Forth Bridges; we cross the Atlantic Ferry in gorgeous leviathans moving at a speed that leaves the natural leviathan far behind; we connect the Antipodes with Home by a thin cord that conveys our wishes with the speed of the lightning; we are being educated to the application of the great forces of Nature to the wants and comforts of mankind. Our standard of beauty is a mechanical one, a prosaic factor of safety, the proper adaptation of means to an end, but tempered by the teaching of the true artist who has impressed us with visual conception of form, colour, and harmony, as the musician impresses us with aural conceptions of tone, order, and melody. Our writers regard facts more than fiction; our poets Life

more than mysticism; our painters Nature more than idealism. This is the age of the engineer.

Hitherto the decoration of our houses has been left to the house-painter and cabinet-maker; now the artist is stepping in. The desire to display wealth and luxury is giving way to the fashion of beauty and harmony. The tone of nature, the poetry of form, the gentle blend of colour, are entering our homes, and electricity steps in to assist, if it has not excited the happy movement. What we have to avoid is the obtrusiveness of the past. The massive magnificence of the brass chandeliers, great glass structures effacing the symmetry of our halls, is out of place. The craft of the coppersmith, the skill of the ironworker, are shaping rude material to do its work with grace and feeling in imitation of nature, which in the tiniest flower that bends to the dewdrop shows how the laws of the engineer are but the rudiments of its own. Stems, leaves, flowers, reflect the spirit of the present day. Dragons and animal monstrosities follow the monks of the middle ages.

A survey of the walls of the Royal Academy Exhibition is an instructive study this year. We find many interiors, but few into which artificial light has been introduced. Chandeliers, candlesticks, lamp-holders are conspicuous by their absence. Painters conclude, therefore, that they are necessary evils, and are best "thought away." The exception is "Signing the First Death-Warrant" (357), where Mr. Pott has faithfully painted an exquisitely wrought chandelier. Perhaps the finest and most realistic piece of colour-painting in the whole show is the red glow of the hammer-beaten anchor in Stanhope Forbes's picture (287); from whatever part of the room this is inspected it impresses one with the feeling of actual warmth and true study. There is another picture, "Old Memories" (53), in which the reflected warm glow of an unseen fire is well depicted, but as a rule the rays of artificial light are pale and sickly, and the yellow, almost orange, tints of tallow, oil, and gas are not realised. Eleven pictures introduce candles, three oil, two the ancient Greek lamp, and only one gas. Electricity is a minus quantity. Most of them show a struggle between parting daylight and artificial light, as though the artist were loth to introduce that which he does not quite understand and evidently does not like. It is certainly strange that when the greater part of our ordinary existence, the principal events of social life, the excitement of the forum, the relief of the stage, the relaxation of the dinner-table, and the charm of the drawing-room are all held under the effects of artificial light, the painter eschews it, and prefers to introduce daylight into impossible positions. The old Dutchmen affected and understood the use of the candle, the modern painter does not. He has not studied the gradation of tone introduced by the torch, candle, oil, gas, and electricity. The lower the temperature the redder the light. The above order might be written bright red, orange, yellow, bright yellow, white. An examination of these illuminants simultaneously lighted in the same apartment would be a good object-lesson to the budding painter. Mr. Melton Fisher's "A Summer Night" (1023), a scene in a Venetian café, is an exception: the reddish light of the Chinese lanterns falling on the faces of the listening idlers is well done; while the stitching

seamstress of Mr. Charles H. Eastlake, "With fingers weary and worn" (687), is pursuing her ill-paid work under the light of a well-painted candle. The Lady of Ripley Castle (708) maintaining her watch over the wearied and sleeping Cromwell, with daylight stealing in at the window, one candle brightly burning and the ascending smoke of the other showing that it has just burnt out, is a very fine example of the study of artificial light. Our National Gallery contains but few pictures introducing artificial light; one by Hogarth and another by Teniers are interesting.

There is a great gulf between the Highland chief who sat at the head of his table supported on each side by stalwart torch-bearers holding aloft the only source of light then available, filling the bleak hall with smoke and smell and throwing but a dull and flickering glare upon the bare board and the heather-strewn floor, and the modern bourgeois, spoilt by science and by fortune, who dispenses his hospitality by the aid of unadulterated white light in pure and cool air, surrounded by well-arranged objects of art, and living in an atmosphere of harmony and feeling. His eye reposes on pleasant combinations of sympathetic colours on wall and floor, his foot treads softly on Oriental rugs; fireplaces tiled and tenanted with pretty bright metal bars radiate warmth, well-carved mantel and over-mantels with niches filled with Persian blue or Japanese china, comfortable chairs furnished by Moorish or Hindoo hands, supply picturesqueness and comfort everywhere, while no attempt is seen at show or luxury, and, above all, throughout the room a clear bright uniform glow mimics daylight.

Science is now advancing with giant strides. She has become the helpmate of man, and Science is but the knowledge of Nature, whose laws are the thoughts of God. "Nature," says Goethe, "allows no trifling; she is always sincere, always serious, "always stern; she is always in the right, and the errors and mistakes are invariably "ours." Cultivated man who yearns after the consciousness of emotion and the soothing influence of harmony and taste, must avoid the vagaries of fashion and obey the dictates of law. Science has utilised nature so as to bring it within the compass of the human intellect, and Art must follow the knowledge thus acquired. As Science and Art are the chief instruments of modern civilisation, so the engineer and the architect must work hand in hand.

W. H. Preece.

ABSTRACT OF THE DISCUSSION.

Mr. JOHN SLATER, B.A.Lond. [*F.*], said it was ten years since the Institute room had been first tentatively lighted by electricity; and about a year previously he had had the honour of reading the first Paper on Electric Lighting there, and he remembered the difficulties there were in getting the light to work. They had then a large arc lamp in the dome, and across one corner of the room were a dozen of Mr.

Swan's small incandescent lamps, which had not very long been invented. Great developments had been made in the storage batteries before the second occasion, and they had some of the Sellon-Volckmar cells. The incandescent lamps gave an excellent and admirable light, fascinating every one who saw them, and led to the hope that before long they would get the light permanently. Science, as Mr. Preece had said, had made very great strides during the last ten years, but he agreed that no great advance had been made in the way of artistic illumination by electricity. With regard to domestic lighting they ran too much on the old lines, and had been far too content hitherto to be satisfied with the ordinary gas fittings for putting electric lamps in. At the Crystal Palace Exhibition there were one or two things absolutely wrong. For instance, at the beginning of the century every one had to be satisfied with candles. While candles were the only means of illuminating, it was perfectly proper to have candles in candlesticks ; but in a large number of instances at the Crystal Palace they had an artificial candle in an artificial candlestick, and an electric lamp stuck on the top of it. That seemed carrying to an absurdity the old customs and ways, because with a lamp which was not dependent upon a stand it was ridiculous to use the old candle-stand in order to show it. As to the lamps in that room, Mr. Preece began by stating, what every one who had seen it would agree with, that the House of Commons was one of the best and most admirably lighted interiors, and possessed the most comfortable form of illumination, so far as illumination went, that was to be found ; but the individual gas-lights which lighted that chamber were all hidden behind the ground-glass screen, so that none of the glare from any lamp reached the eye, and all the light was perfectly diffused. That was what ought to be aimed at, as Mr. Preece had said, in rooms, whether public or private, in the way of artificial illumination. But he could not quite understand Mr. Preece's argument, and he should be glad if, in his reply, he would explain more fully how one could have the effectiveness of the light undiminished when screened. Any amount of screening must to a certain extent diminish the effectiveness of the light. Mr. Preece was undoubtedly correct in saying that from the point of view of pure economy an unshaded filament was far the cheapest way of obtaining light. But artistic effect was not always compatible with economy. A plain brick wall with square openings for windows was the cheapest form of house-front; but if one wanted artistic effect, one must spend money in treating the front architecturally. If one had a plain thing, of course, one must pay for enriching it. And in the same way, if one wanted an artistic effect from electric lamps, a somewhat more expensive arrangement of screens or shades was necessary than if one had the plain filament only. From where Mr. Preece was standing the speaker was perfectly certain that the lights over his head were excellent, and could not be improved. Where he was sitting, three of them were as good as they could possibly be, but the fourth was shining directly into his eyes. Unless, therefore, they had exceedingly low-power lamps, which was not economical, they were bound in some way or another to screen off the direct glare of the filament. Let them take any one of the lamps with a ground-glass globe; sideways the amount

of light which came to the eye or to the work for which it was used was undoubtedly diminished by the very pretty ground-glass leaves which partly curled round the globe, and which made it very effective to look at. They *must* in one way or another slightly diminish the natural effectiveness of the lamp before they could use it with any pleasure. The lamps undoubtedly lost 50 or 60 per cent. of their illuminating power by being enclosed in the ground-glass globes. Even with the cut-glass globes to which Mr. Preece had alluded, and the effectiveness of which none could deny, the light was broken up so that at any individual point they did not get the full effect of the filament. The attempt which had been made at the Crystal Palace to accentuate the architectural features of a ceiling by having incandescent lamps placed at the junctions of the mouldings, or in little hollows, or something of that sort, was an exceedingly effective means of illumination; but such a method of illumination was to a certain extent extravagant, because the reflectiveness of the ceiling was lost—and no one who had not tested it could be aware of the immense illuminating effect which a white surface such as a ceiling gave in a room. He remembered very well in one of the Paris Exhibitions that a room in the building was illuminated in a way which was one of the most perfect specimens of artistic illumination he had ever seen. An arc lamp was placed on a stand in the middle of the room; it was completely screened and shaded by shrubs all around it; but it was so placed that it shed a very strong light upwards on a white screen, and the whole of the light of the room came diffused from the screen. The more the light could be diffused and distributed, the better it would be, and the more comfortable for every one who had to use it.

Mr. HENRY DAWSON [*F.*] did not understand Mr. Preece to suggest that they were not to shade the light, and that any covering put over the filament would not diminish the light. It must diminish it; but the great thing was so to shade it as to take away its glare; and in the Crystal Palace there were two or three very excellent methods. He agreed that the best example there was that in which very beautiful and finely-cut glass was used. The next best method was a very simple one of shading the light by strings of glass beads, which struck him as very beautiful, being exceedingly luminous and effective, and yet diminishing the light very slightly. The way in which light was concentrated upon a picture without any glare to the eye was a very great advance in the way of lighting pictures. The installation of a drawing-room with lights on the ceiling was also a very valuable hint; but he considered that it would be better if, instead of the lights being at the intersections of the ceiling ribs, there were a kind of inverse saucer or reflector in the panels of the ceiling, and the light suspended some twelve inches below, so as to get by reflection that effect to which Mr. Slater had referred.

Mr. T. TAYLER-SMITH thought that the subdivision of the mains into many minor circuits assisted in lessening the size of the conductors, enabling them to dispense with fuses in the room; it enabled them also to run the wires direct to the lamps through small tubes, without necessarily using the hideous casing which was often seen in rooms. There was scarcely any building—at any rate, any small building—

in which the electric light had been installed without the casing being thrown across panels, without bridging cornices, or cutting through mouldings, which could now be avoided in many ways. The arrangements for electric lighting might be classified under three heads: First, direct, *i.e.* lights, whether opalescent, ground, or slightly shielded with globes; secondly, shaded; and, thirdly, reflected. With regard to the lighting by direct means, one room at the Crystal Palace lighted from the ribs of the ceiling had been described. Personally he would not recommend a client to light his private dining-room in such a way. There were many objections to it. The grill-room at the Holborn Restaurant was lighted, not from the ribs, but from the cove of the ceiling. At the Constitutional Club, a charmingly-lighted room had a beautiful white or cream-coloured frieze, and being lighted from the ceiling, ample light was obtained. No doubt public rooms, ball-rooms, state-rooms, lecture-rooms, auditoriums of theatres, and places of that class, were best lighted by direct means. Lighting by means of reflected light, of which he was a great admirer, enabled them to get much more artistic effect than by any other system. Bearing in mind the overcrowded drawing-rooms, he had found that by throwing a high light on works of art, statues, flowers, bowls of fish, shielding the light entirely from the eyes, a reflection was obtained which helped to give that repose so often wanting. A shade over a white dining-table, too, gave a large amount of reflected light which was very charming; but when the cloth was removed the effect was gone. Very charming effects were obtained by a combination of the arc and the incandescent light. There were many places, such as courtyards, stableyards, or drives, where, by allowing the rays of an arc lamp to be thrown on to a ground-glass or stained-glass window in a corridor or a staircase—using, at the same time, small and high assistant incandescent lamps, getting a warm light instead of a cold one, yellow instead of white—a combination was obtained of the white bluish light through the stained glass with the little glow lamps which had a very beautiful effect.

Mr. W. BAINBRIDGE REYNOLDS thought the quality of freedom of movement or unrigidity which differentiated the electric light from all other methods of lighting was one which should be expressed in the design, and consequently the best position of a glow lamp was vertical and pendent. That position, too, had the advantage of absolutely avoiding shadows. For large rooms the lamps should be in clusters, not formally arranged, but with some sense of picturesqueness. He considered that electric light fittings should be quite unobtrusive, although, if of polished iron, the utmost refinement of detail might be obtained in them.

Mr. E. MANVILLE said that it had been usual to talk of lamps of so many candle power, which meant little or nothing unless it was known at what height the lamps were suspended. Perhaps one great advantage of the electric light, which ought to be taken into consideration with its undoubted extra cost, was the fact that the light could be placed much nearer to the object to be lighted; and therefore, if they had to pay twice as much for the electric light, they might reasonably be supposed to do with possibly half as much light. The rate of incandescence at which they could

burn an incandescent lamp distinctly affected what one might term the pleasurableness of the lighting. Abroad, the lamps were burned at a much brighter rate of incandescence, and the result was far better than burning them at such a rate as to make them look something like red-hot hairpins. Ground glass was certainly a very inefficient method of shielding the light of incandescent lamps. Where you could have an incandescent lamp near the object to be lighted, and could place a shade between it and the eyes so as to get the undivided light of the lamp upon the object, probably no better effect could be obtained; but where lamps had to be suspended above the eyes, probably some efficient mode of cutting the glass was the best method of directing the rays of light away from the eyes without cutting off more of them than was absolutely necessary. A point that must have some weight with architects was the necessity of having places which were lighted by electricity properly and efficiently wired up, as it was now termed. In cases where tenders were obtained from those who liked to send them in, and people with names that you had never heard of before were those to whom the work was given, it was absolutely essential that they should be tendering to very detailed specifications which should prohibit anything but the best class of work being put in, and that rigid supervision should be maintained over them during the execution of the work. No doubt the utilisation of light by reflection was a very admirable method of lighting a room; but the bill for lighting a room with a reflected light, costing four to six times as much as it might cost if the lamps had been lighted direct, would be looked at askance by those who consumed the electric light.

Mr. R. E. CROMPTON agreed with Mr. Preece that the only new thing in design had been the simple electrical single-light pendant. That was the way in which the distribution of the electric light lent itself to the most economical use of the light in rooms; and artistic minds should be directed to the further development of pretty, elegant pendants, as far as possible consisting of single lights. Heavy pendants with many lights were only suitable for large vestibules, halls, foyers of theatres, and such places, and the great chandeliers and lustres of the past should be relegated to their own object of centre lights in the auditoriums of theatres. The great lustre of a theatre when used for electric light, instead of being balloon-shaped with the larger part downwards, should be exactly the reverse; it should commence with the broad expanse of lighting at the top, coming down with graceful concave curves, with a delicate pendant single in the centre. It was astonishing what beautiful and splendid effects the mere arrangement of the light in that form gave. Mr. Preece was a strong advocate of lighting from the ceiling; but he himself was very greatly against lighting from the ceiling. In the case of the Constitutional Club, which had been mentioned, the effect was bad. They did not light a room simply for the room itself, but also for the people who were in it; and no man or woman looked well if he or she had deep shadows thrown from top lights which made penthouses of the eyebrows. There was, however, one thing that English electrical engineers had succeeded in doing well, and that was in lighting dining-rooms. That was because they had nothing to do but

to throw down on to the dining-room table a strong light, which was reflected from the white cloth on to the people's faces. He had used lights of that kind to throw the light against pictures, where they had them; and with just that light alone, and very little light indeed in the general atmosphere above, had produced effects which everybody was pleased with. What was wanted, and what they had not yet got, was a long graceful pendant coming out some distance from the wall, and yet not obtrusive in daylight. No doubt Mr. Preece was right with that rule as to the sixteen-candle lamps at the distance apart he had named, as giving the most effective illumination. It might be a trifle more than was necessary, but still the rule was a very good one. The lighting of a room when people were sitting down with a small company present was quite different from the lighting required for a ball-room or an evening party when a room was crowded. In the latter case, men's faces were at least two or three feet higher than in the former, and the lighting was different. The difficulty might be met by having lights from eight to nine feet high in single pendants disposed over the room, and also a certain number of standard lights which could be removed on days when they were at home on ordinary occasions. As regarded the brackets, he did not want to be critical; but he was not satisfied with the brackets with scallop shells; and did not think the light should be put in a scallop shell. He had had a good deal of experience of lighting in theatres, and had received the greatest assistance from continental artists. At the Burg Theatre in Vienna, some of the most perfect examples of fittings and artistic arrangements for electric lighting were to be seen. Those effects which were shown in Siemens's small toy theatre at the Crystal Palace had been carried out at Vienna on a magnificent scale eight years ago with perfect success; and none of the English theatres he had seen had anything approaching to the Burg Theatre at Vienna.

Mr. JOSEPH GODDARD [*F.*] had had a small electric installation running for nearly seven years, and although it was a costly proceeding to begin with, yet he had never for a moment regretted it. He had tried many experiments, and after trying fine-cut glass, which he did not think artistic, had gone back again to the plain ground glass lamp. To a certain extent it obscured the light, but at the same time it gave that pleasant colour which certainly clear glass did not give. In a room that was pleasantly furnished with pictures and books and surroundings, the light was much more agreeable, if it was not diffused evenly, and they could get the effect of the light in any particular spot by putting the lamps in different positions. He preferred to throw the light upon pictures and other decorative objects upon the walls, and to put lamps carefully shaded where they actually wanted to use them. The more they did away with fittings, and the simpler they were made, the better. They should be unobtrusive, not drawing attention, as the eye should be kept away from the lamps. The lamps should not be in groups, but hung pendent from the ceiling and near the walls, so that they could be used with reflectors if necessary; and there should be attachments around a dado rail for temporary lamps, for reading and working lamps. The only place where a group of lamps was permissible was over the dining-table, and those

should be carefully shaded, pendent cords being far better than an elaborate electrolier.

Mr. A. SLATTER considered there was no better way of fitting up the electric light than by running the casing on the surface of the walls. It was certainly attended with little or no risk, whereas by running the casing inside the walls one was very liable to meet with the greatest danger electric engineers had to contend with, and that was short circuits by reason of dampness of the plaster reaching the wire. With reference to the Constitutional Club, which had been mentioned, a great deal of light was wasted by putting the lights so high up. The National Liberal Club had been lighted in much the same way, but all the lights had now been brought down to the level of about twelve feet from the floor, thereby saving a vast amount of light, and decreasing the electric-lighting bill by a very large amount. As to reflection of the light, he had carried out some very interesting experiments at the Mansion House in lighting the windows of the Egyptian Hall by means of arc lamps, so that the rays of light might show up the stained-glass windows by a light similar to daylight, and the effect was very good.

Mr. W. H. PREECE, F.R.S., in reply to Mr. Slater said it was quite true that they had ground glass in the ceiling of the House of Commons, and they had their light beautifully distributed; but he had seen the bill, and knew what a frightful waste of gas there was in the House of Commons in lighting it up in that particular way. The moral of nearly all in his Paper was that they did not want to have the light in their eyes; and the problem to solve was, How could the glare be avoided? He was only an advocate for ceiling lighting when one could not put the lights anywhere else. If the lights were obtrusive, they must be shaded from the eye, but not from the objects they had to illuminate. The lights should be put so as to distribute the light in the proper direction; the problem for the engineer was to supply the energy, and the problem for the architect was to distribute that energy in the best way he possibly could, so as not only to decorate his rooms, but to bring out the beautiful objects which moved about in those rooms, as effectively as possible. Mr. Crompton referred to the scallop shell as not being the right thing to put a lamp in. If they wanted a lamp *per se*, a scallop shell was not the proper thing to put the lamp in; but a scallop shell was a very beautiful object; and the ancient Greeks evidently had something like it in their minds when they designed those pretty lamps in bronze and earthenware that one came across in museums. But supposing that they had a picture or some tapestry on the wall, what was nicer than those scallop shells used as reflectors [figs. 108, 109]; and the secret was, how to direct the light just to the spot where it was wanted. With lamps burning four watts per candle, an absolutely uniform distribution of light was obtained by following the rule he gave. He contended that the use of ground glass was absurd when they had their light so high that nobody could look at it without cricking his neck. He did not say its use was always absurd. The engineer might do what his science taught him to do, but the proper way, after all, of illuminating rooms was in the hands of the architect.

NOTES ON ELECTRIC LIGHT FITTINGS.

By Mr. J. Starkie Gardner.

SOME hints to the designers of lamps for electric light in private houses may not be out of place in connection with the few illustrations here contributed. As to economy, it seems immaterial whether the lights are placed high enough in the room to be used unshaded, or brought low down so as to require shading. The latter course is almost always preferable. Then as to the amount of light, the tables given are very valuable; but it must be remembered that there is a most appreciable absorption of light in coloured rooms, especially in those panelled in dark woods, and with dark upholstery and ceilings, and that twice the light may have to be used in such cases as would suffice in rooms with white or pale-coloured walls. An evenly diffused light is seldom desirable, since portions of rooms may be arranged for writing and reading, and other purposes, where a strong light is necessary, while other parts may be used for conversation and repose, where shade is pleasant. Experience is the only guide in these cases.

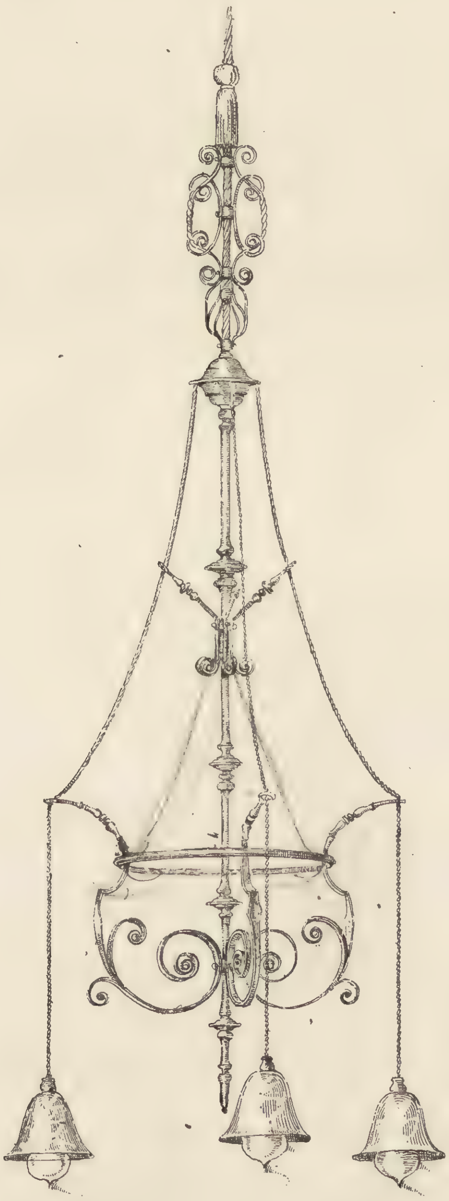

Fig. 99.—Polished Iron Pendant.

Next, as to the forms the lamps should take. We should remember that we have not only the light to consider, but the part the lamp is to play in the decorative scheme of the room. The magnificent bronze and marble lamp-stands of the Romans were quite superfluous for purely light-giving purposes; and a cluster of glasses on wires with oil and wicks would have given more actual light in a mosque than the elaborate lamps known to Eastern art. A ring, hung from chains, and furnished with prickets or nozzles, would be a better lighting contrivance in a church than the most beautiful Flemish corona; and from the utilitarian point of view the fine works in bronze, ormolu, and beaten iron, devoted in every age to lighting purposes, are all

practically a great mistake. Still, perhaps we can hardly expect that those responsible for decoration will forego the finishing charms of something at least recalling the old chandeliers, girandoles, lustres, brackets, and candelabra we admire, and of which, as a matter of fact, a very large number are being produced for electric lighting without any change in the models whatever. Thus the change in the nature of the light is not, it seems, to be accompanied by such a wholesale destruction of all that went before as

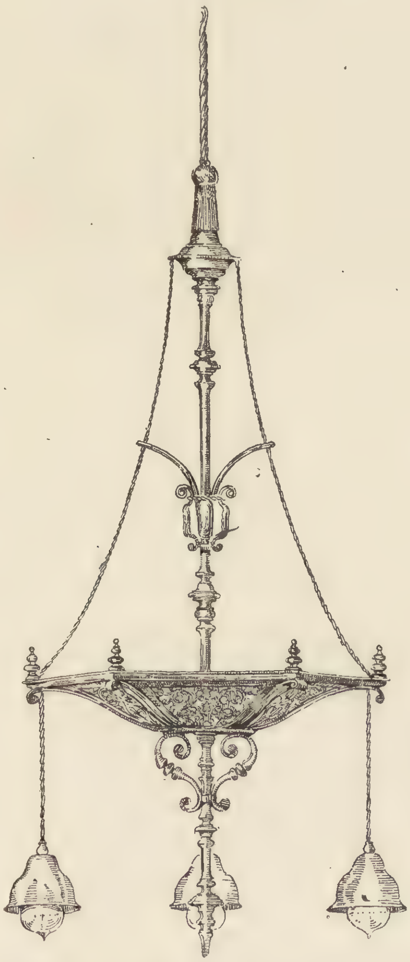

Fig. 100.—Polished Brass Pendant.

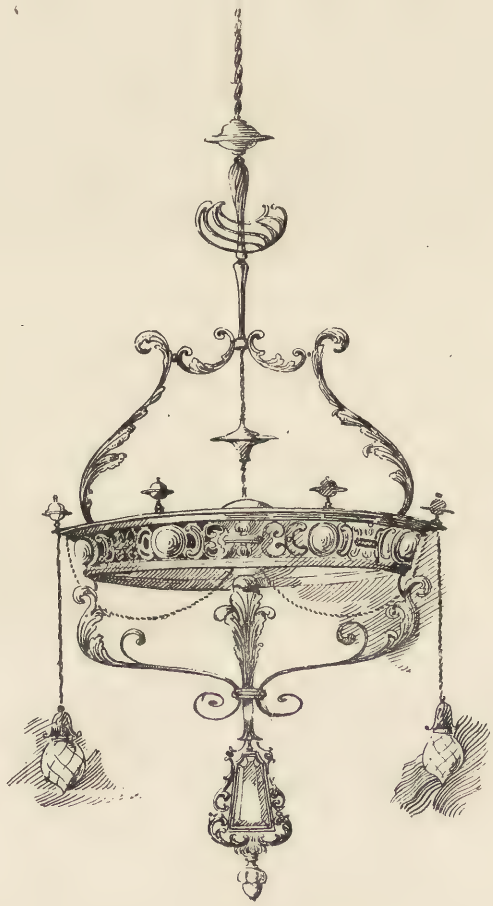

Fig. 101.—Brass and Iron Corona.

accompanied the introduction of gas, with the result that lamps of the time of our grandfathers are quite rare. If the massacre be confined to gas-fittings we shall be grateful, but it is unfortunately apparent in the case of the Mansion House that some electricians are disposed to show little quarter to lamps of even respectable antiquity and fine forms; and, fortunately for designers, it is scarcely probable that the electrician will control the artistic forms which the lamps of the future may assume.

Then as to material. The designer has at command, not only all the metals and

glass, but many beautiful substances, such as ivory, horn, tortoiseshell, mother-of-pearl, onyx, and others, which would not stand the heat of naked flames, besides the unlimited use of textile fabrics and upholstery.

Finally, as to inspiration, it is the correct thing to refer students of design to the garden. I have not found, however, that veteran designers, whatever they may preach, draw their own inspirations direct from Nature. We must take things as they are, and not as they ought to be; and it is impossible to disguise the fact that architecture and decoration are reproducing, with more or less fidelity, as well as endeavouring to improve on, the various styles of the past. Metal-work is but a

Fig. 102.—Corridor Lamp.

Fig. 103.—Black Iron Pendant

small adjunct to architecture; its designers cannot isolate themselves, and cannot design on principles other than those followed by the general brotherhood of art. Moreover, only the most skilled and experienced designers can make satisfactory designs direct from plants and the lower forms of animal life in their natural state, and the results of most attempts in this direction, especially perhaps in jewelry, are failures. One unfortunate manufacturer, fired with the idea of designing direct from his own garden without the necessity of paying for designs, recently produced an extensive catalogue of electric light fittings in wrought-iron, reproducing branches of fuchsia, arum, and other plants as realistically as the material permitted, except that one or two flowers

on a spray were puffed out to the dimensions requisite to receive a lamp-holder. Crude copies of flowers deprived of all that makes the originals so beautiful—without arrangement, life, colour, movement, perfume, reality—are absurd, and the sale of such electric light brackets has been no doubt surprisingly disappointing to their producer. Perhaps when we have given every past style of architecture a trial, and come

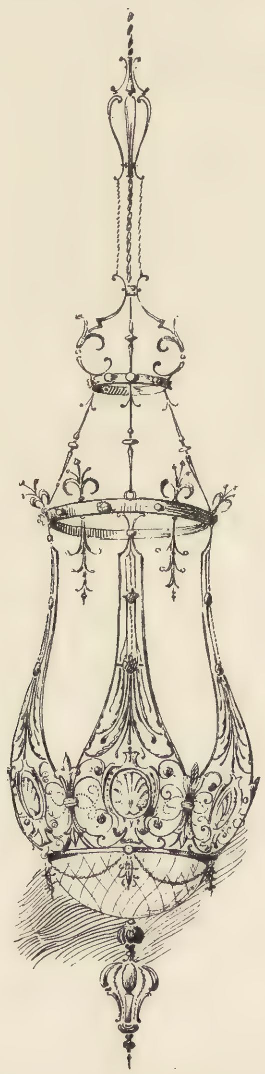

Fig. 104.—Light Iron Pendant.

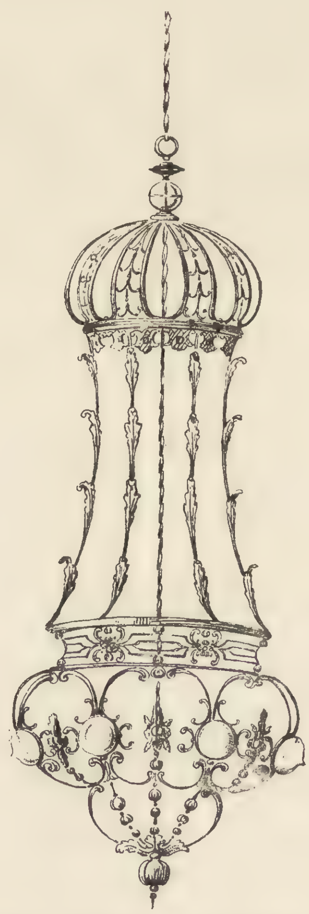

Fig. 105.—Light Iron Pendant.

to the conclusion that the threads of art must be picked up where they were lost, when science took the place till then monopolised by art in the people's mind, nearly a century ago, we may begin once more to develop a settled art of our own; and, should this happen, the garden may possibly be of account.

Of the illustrations, a small polished iron lamp [fig. 99], designed by Mr. Aston

Webb for a country house, should commend itself to the author of the Paper, since it consists simply of a ring, and little more than the spars necessary to keep the lights and cords apart. It has, nevertheless, considerable dignity and refinement in execution, for, as in a ship's rigging, the visible adaptation of means to an end is always a charming feature in design. A polished brass lamp [fig. 100] for the same house is more enriched, and has fine detail of English Renaissance character. The large, pierced, hexagonal dish acts somewhat as a reflector, and its introduction needs, therefore, no apology.

Fig. 106.—Black or Gilt Iron Pendant.

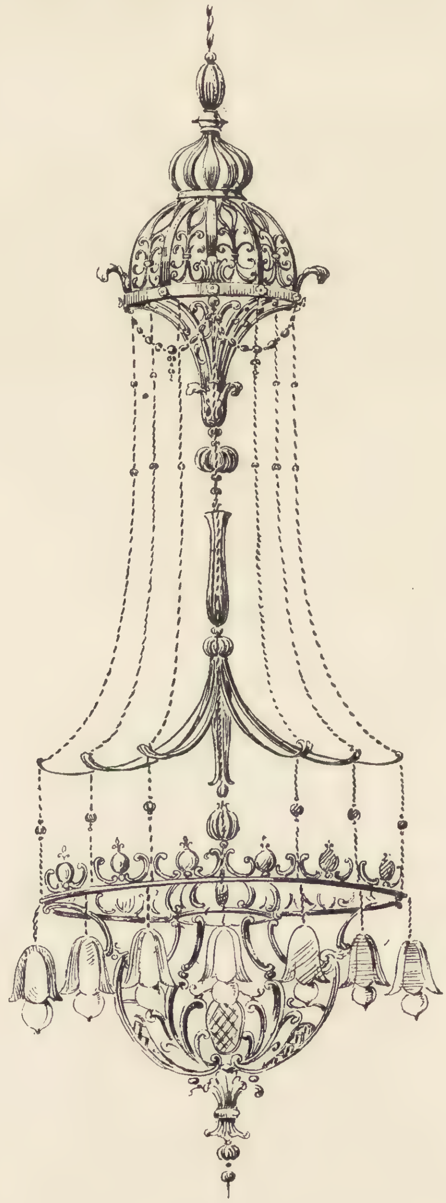

Fig. 107.—Club-room Pendant.

The remainder of the illustrations should be regarded as suggestions rather than finished designs. Fig. 101 is a corona, formed of two moulded bands in brass, the upper one projecting cornice-wise over the lower, so that the electric cords depending from it can clear the rest of the lamp. The bands are separated by light black iron scroll-

work, with large moulded collars in brass and polished flint-glass balls. The corona has no central rod or cross-ties, but is kept in position by bent and foliated iron supports. The combination of brass and iron, though seldom satisfactory, is in this case much assisted by the polished glass, and looks extremely well, especially in a subdued light.

Fig. 102 is a suggestion for a corridor lamp, where the ceiling is high and the passage narrow. It merely consists of a flint globe, finely roughened inside, in a lyre-shaped frame of light black iron.

Fig. 103 is a light pendant for a card room, and should be made with not less than three, or more than four, arms, in black iron.

Fig. 104, a net or bag-shaped pendant of light iron finishing in a cut-glass dish, within which the lights are clustered. The pearl oyster, or *haliotis*, or shells of moulded glass may be introduced as medallions in the network. The details can easily be varied in this form of pendant to suit several of the styles of decoration now in use; or it can be adapted to reflect the light up on to the ceiling—a pleasant, if expensive, way of obtaining a soft and diffused light in a room.

Fig. 105, a light iron pendant, the outline suggested by a mosque lamp. The outlines of a vase or pot are reproduced in filigree ironwork, and this is suspended by rods or chains from a canopy. The lights, which should be of roughened glass, stand out as pearls project from their setting. A lamp of this form has a fine effect if well executed. The design can be varied *ad infinitum*, since cups and vases of suitable outline abound in museums and shop-windows.

Fig. 106, a basket-shaped pendant for five or six lights, of black or gilt iron, with polished flint-glass balls. This, if kept small and delicate, will be found an elegant and useful form for drawing-room or boudoir, as it may so easily be varied to suit any of the French or English last-century decorations.

Fig. 107, a pendant for a club dining or reading room, of an outline suggested by the old George IV. lustres. The outline is very much left to the numerous flexible electric cords, which are stayed out by scrolls and a ring of metal. The body of the lamp consists of a canopy of rather close ironwork, from which a more open censer-shaped ornament is suspended. This pendant should be gilt, or, if more carefully designed, might be executed in brass.

Perhaps I may be permitted to say in conclusion that the most remarkable work yet published on Lighting is that by M. Henry René D'Allemagne, Archiviste-Paléographe, and member of the Organising Committee for the Pavillon du Gaz at the Paris Exhibition of 1889. It is entitled *Histoire du Luminaire depuis l'époque Romaine jusqu'au XIX^e siècle*, and contains some 700 folio pages, with 500 illustrations in the text, and 80 plates*—a most beautiful production.

J. Starkie Gardner.

The two illustrations which follow are from fittings designed and executed by Mr. T. Tayler-Smith, and allusion is made to them by Mr. Preece at page 313 *ante*.

* Fo. Paris, 1891.

Fig. 108 is intended to light a picture or a frieze, and it may also be placed over a door, or wherever light is required to be reflected upwards. The flutings of the shell which holds the light assist in reflecting the rays upwards. Fig. 109 is a shell bracket specially suited, it is stated, to a dining-room. Where a subdued lower light

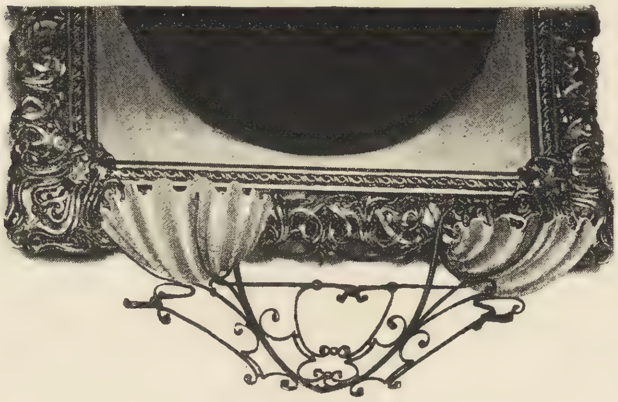

FIG. 108.—PICTURE LIGHT.

FIG. 109.—BRACKET LIGHT.

is a desideratum, a highly "iced" or an amber shell is inserted, which in no way militates against the effect of the upward rays.

MR. PREECE'S SPECIFICATION FOR ELECTRIC WIRING.

DEFINITION OF THE TERM "WIRING."

1. By the term "Wiring" is meant the whole of the materials and work for a perfect installation of arc lamps, and glow lamps of volts, and of the various candle powers given in the schedule, erected and fitted up complete in or upon the above-named building, with the following exceptions only, namely, no electrical or other machinery, or any apparatus for generating or storing electricity, or any transformer, or work in connection therewith is included.

DISTRIBUTING BOARD.

2. The wiring contractors' work shall begin at the , and from thence well insulated main cables, complying in all respects with the conditions hereinafter laid down, shall convey the current to the distributing switch (or fuse) board. This shall be constructed* of some approved incombustible and non-conducting material fixed in some approved position; and so located that it shall divide the current from the mains through the submains or branches serving the different circuits into which the building will be arranged. This distributing board shall carry a voltmeter and an ammeter, so that the pressure in the building and the quantity of current flowing shall be visible; and it shall also carry double pole fuses in each circuit so as to obtain security in the event of any short circuit or accident in the building.

Provision must be made on this distributing board for circuits serving the various parts of the building. As far as can be arranged no circuit shall carry more than amperes of current at full load.

* Usually of slate, with a case of polished teak, with glass panelled lock-up door.—W. H. P.

Insulation and Conductivity Standards.

3. All the conductors shall be substantially and carefully insulated with the very best and well-approved material, whose specific insulation must be specified—that of gutta-percha at 75° F. being taken as unity—and be properly protected externally by braided flax or cotton, and treated with some recognised preservative coating.

The insulation resistance of all conductors used must in all cases be specified. It must not be less than *300 megohms per mile in any case. Each coil of wire or cable when delivered must be accompanied by the maker's certificate, giving the maximum resistance of the conductor per mile at 60° F., and the insulation resistance per mile, tested in water after 24 hours' immersion, also at 60° F.

The insulation resistance of the whole equipment, with all lamps fixed, shall be not less than ohms. The reading to be taken from the distributing board with all circuits, and the mains bunched.

The conductivity of the copper shall in no case be less than the conductivity of pure copper according to Matthiessen's scale; and it must be tinned if vulcanised indiarubber be used for insulation.

Current Density to be Specified.

4. In all cases the current the conductor is intended to carry, and the density of the current through the wires of all sizes, shall be specified; and in no case shall it be greater than 500 amperes per square inch, except in the case of flexible twin wires for pendants, where a density not exceeding 1,000 amperes per square inch will be allowed.

Other metals than copper for switches, &c., shall be in sectional area proportionally equal to pure copper based on a current density of 1,000 amperes per square inch.

The potential difference between the conductors at the furthest, or at any lamp on a circuit, shall not be more than 1 per cent. below that shown on the voltmeter at the distributing board.

Flexible Twin Wire.

5. All flexible twin wire must be of the very best material, insulated with pure rubber, and protected externally with silk. It must always be within sight, and be attached to proper incombustible ceiling roses or to approved plugs.

Joints.

6. All joints must be made in the most approved fashion, the copper being thoroughly soldered with resin only, made smooth and free from points, and afterwards carefully insulated.

Cut-Outs.

7. The fusible cut-outs must be of an approved pattern, fitted on porcelain or other incombustible bases, and they must always be placed in visible and accessible positions. No molten particles of a fuse must be able to leave the fuse box. All fuses must be guaranteed to act when the current is 100 per cent. in excess of its normal strength.

Wooden Casing.

8. All wires, except where used for suspension or portability, must be encased either in lead or in wood, and the wood casings must be grooved and of the best well seasoned dry hard wood, and must be fitted with neat mouldings, screwed on and finished off by paint or otherwise, to suit the decorations of the rooms. The positive and negative wires must be in separate grooves, and be marked. The wood casings and covers must be painted with good lead paint, or prepared with shellac varnish, before being fixed. They must be kept well away from any telegraph, telephone, or bell wires, and also from all gas, water, heating, or other metal pipes in the building.

The covers of the casings must be fixed by screws through the side fillets, and not through the centre. The width of centre fillet should be :—

For main cables	2 inches.
For branch cables	1 inch.
For single conductors—not less than	½ inch.

* If alternating current, minimum insulation should be 600 megs. per mile.—W. H. P.

Where a mitre occurs, every care should be taken to keep the fillet as wide as possible. It must be in no case less than half an inch in width.

No conductors are to be attached to any materials by means of metal staples.

Lamp Switches.

9. The switches that are used in the rooms in conjunction with the lamps, that is, for turning them on or off, must be of the very best quality, and of approved pattern.* The number and character of the switches proposed to be used must be inserted on the attached schedule. They must be fixed in approved positions so that the lamps can be most easily and conveniently controlled. The average height of the switches from the floor line should be feet.

Lamps.

10. The glow lamps used must be those supplied by the Edison-Swan Company, mounted with Edison caps and Edison holders. They must have a voltage of volts, and the voltage and candle power must be marked on each lamp.

Fittings and Shades.

11. Simple fittings and shades will be used throughout. These must be of the best quality, of a pattern to harmonise with the surroundings, and be subject to approval. No existing gas fittings are to be used as supports.

12. Samples of the casings, cables, switches, ceiling roses, fuses, flexible wire, &c., used must be submitted for approval. Sample joints, showing the style of workmanship, must also be submitted for inspection.

Cutting Away, &c.

13. All structural alterations, such as breaking through walls or ceilings, and all other cutting away, making good, touching up decorations, and joiners' and masons' work of all kinds, must be done by the installation contractor in a satisfactory manner and to the approval of

Official Business not to be Interfered with.

14. The official business carried on in the building is not to be interfered with in any way during the progress of the work.

Installation to be left in Working Order.

15. The whole installation to be left in thorough working order.

Contractor to Make Good Defects.

16. The contractor is to be prepared to make good any defect that may be traced to imperfection of workmanship or of material, or not due to fair wear and tear, that may arise within a period of twelve months from the acceptance of the contract.

Work to be done in Accordance with the Fire Office Rules, &c.

17. The whole of the work is to be done in accordance with the Rules of the Fire Insurance Offices, the Institution of Electrical Engineers, and the Electric Supply Co., and in a sound and workmanlike manner, and the work must be finished by 189 . The contractor shall pay the sum of £ per day for each and every day that any part of the work remains unfinished after that date, and the amount of penalties thus accruing shall be deducted from any moneys which may otherwise be due to him under the contract.

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* I usually specify all single lamps to have separate switches.—W. H. P.

Extra or Altered Work.

18. Any extra, additional, or different works shall not be allowed for unless an order for the same in writing be given and signed by specifying that it is for extra or altered works.

Disputes to be Settled by Arbitration.

19. The whole of the work is to be done to the satisfaction of If any dispute shall arise as to the mode of carrying out the work, or the interpretation of the contract or otherwise in relation thereto, or in settlement of the account, the same shall be referred to arbitration in the manner provided by the Common Law Procedure Acts, and the award of the arbitrator or umpire shall be final and conclusive, and no action shall be brought in reference to the matter in dispute except for the purpose of enforcing the award.

Contractor to be Discharged if the Work is Improperly Done.

20. If, in the judgment of the work is improperly conducted, or sufficient despatch is not used about it, he shall have the power, upon giving to or leaving at the last known place of residence or business of the contractor six days' notice in writing, to dismiss him and his workmen from the work, either wholly or in part, and to appoint other persons, contractors, workmen, or labourers, who shall supply, either by day work or otherwise, the requisite labour, workmanship, materials, means, and appliances, for the due execution and completion of the contract; and the costs and charges incurred in so doing shall be ascertained by and paid for or allowed by the contractor; and it shall be competent to the said to deduct the amount of such costs and charges out of any money due, or to become due to the contractor.

N.B.—Those tendering are at liberty to make any suggestion they may please for the modification or improvement of the work specified, and to rearrange the lamps either in groups, or by replacing small lamps by single glow lamps of a greater capacity.

General Post Office :
London, 189 .

Notice to Persons Tendering.

1. Tenders are to be delivered by post or otherwise by noon on the day of 189 , under cover addressed to and marked on the cover "Tender for the Electric Wiring of
2. The do not bind to accept the lowest or any tender.
3. Any modification which a person tendering may desire to make in the conditions laid down in the attached specification or otherwise, is to be made by means of a letter accompanying such tender.

Form of Tender for Electric Wiring.

To

Sir,

of in the of hereby offer and agree to carry out the work of installing arc lamps and glow lamps of the voltage and candle power given in the attached schedule in or upon the premises known as and in all respects according to and in conformity with the terms of the specification attached thereto, and subject to the stipulations contained therein for the sum of £

Signature of Person Tendering

Address

Date 189 .

PADDINGTON NEW DISTRICT OFFICE—ELECTRIC LIGHTING.

Schedule of Lamps.

Part of Building.	Arc Lamps.		Glow Lamps.		Fittings.
	No.	Watts.	16 C.P.	25 C.P.	
Basement.					
Centre Store	...	...	...	8	Pendants
Postmen's Room	...	...	5	...	"
Sorters' Room	...	...	6	...	"
Stores	...	...	2	...	"
Subway to Station	...	...	3	...	Bulkhead fittings
Coals	...	...	1	...	" "
Mail Drivers' Room	...	...	3	...	Pendants
Boiler Room	...	...	3	...	"
Spare Room	...	...	5	...	"
Lamp Room	...	...	2	...	"
Parcel Postmen	...	...	6	...	"
Overseers' Room	...	...	3	...	"
Porters' Room	...	...	3	...	"
Lavatories, W.C.'s, &c.	...	...	4	...	" or brackets
Stairs	...	...	2	...	Brackets
Ground Floor.					
Parcel Room	...	...	...	98	Pendants
Loading Yard	2	500	...	...	Suspended from iron principals
Overseers' Rooms (2)	...	...	4	...	Pendants
Lavatory, W.C.'s, &c.	...	...	3	...	Pendants or brackets
Stairs	...	...	3	...	Brackets
First Floor.					
Sorting Room	...	...	...	104	Pendants
Overseers' Rooms (2)	...	...	4	...	"
Lavatory, W.C.'s, &c.	...	...	3	...	" or brackets
Stairs	...	...	3	...	Brackets
Second Floor.	...	...	...	...	
North End: Postmaster's Room	...	...	3	...	2 Pendants, 1 Table Lamp
Chief Clerk's Room	...	...	2	...	Pendants
Clerks' Room	...	...	4	...	"
Spare Room (1)	...	...	2	...	"
Spare Room (2)	...	...	4	...	"
Spare Room (3)	...	...	2	...	"
Urinals	...	...	1	...	Pendant or bracket
Stairs, &c.	...	...	2	...	Brackets
South End: Eating Room	...	...	6	...	Pendants
Spare Room	...	...	4	...	"
Stores	...	...	1	...	"
Retiring Room	...	...	1	..	"
Larder	...	...	1	...	"
Kitchen	...	...	6	...	"
Scullery	...	...	1	...	"
Library	...	...	4	...	"
Stairs	...	...	2	...	"
Total	2	...	114	210	

Circuits.

Basement	2
Ground Floor	5
First Floor	4
Second Floor	2
Total	13

XCVIII.

CASTINGS IN METAL. By Alex. Graham, F.S.A., *Fellow*; Mr. C. Krall; Mr. H. Longden; and Mr. W. Herbert Singer.

Mr. J. Macvicar Anderson, *President*, in the Chair.

HISTORICAL.

Mr. President and Gentlemen,—

THE application of metals to the adornment of buildings may be traced to a very remote period of the world's history. The glitter of gold, the sheen of silver and copper, and the lustrous qualities of tin have proved attractive to mankind in every age; and although these products of the earth have contributed to man's destruction by enabling him to fashion terrible implements of war, they have at least conferred lasting benefits on the human race by the creation of countless industries for comfort and delight. The exact period when the work of the hammer and chisel was supplemented by acquaintance with the earthen mould is not recorded, but we may presume that with the first forest fires originated the idea of the fusing of metals. To Phrygia is attributed this distinction, but the statement is based only on tradition. Rather let us believe that the art was known to the Israelites in the still earlier time of Moses, and that the cast sockets and rings of silver noted in the Book of Exodus, the mercy-seat of pure gold and the cherubims of beaten gold, were the work of craftsmen in the camp of the great lawgiver. The beating of copper, which existed in a natural state in the cradle-lands of the world, must have been familiar to the earliest races, though the art of fashioning it for any other purposes than rude weapons of warfare may have suggested itself at a much later period. The leathern shield, with its studs of glittering copper, hung upon the rough walls of a chieftain's hut, was probably the earliest piece of decoration applied to buildings—the progenitor of a long line of ornamental discs and pateræ that may be found as a feature of decoration in nearly every style of architecture. Long familiarity with the use and working of thin sheets of beaten metal leads one to suppose that the earlier founders, following the methods of workers with hammer and chisel, made their castings as thin as possible, and attached them to a wood foundation with pins of metal. This would suffice to account for the scarcity of ancient examples, whether in pure copper or in bronze.

It is doubtful whether the Phrygians, as the presumed discoverers of this branch of art, made any progress with their invention; but we know that the knowledge must have spread with rapidity in other countries. Were not the walls of Babylon defended by a hundred gates of bronze, with jambs and lintels of the same material; and have we not in the British Museum a solid cast-iron sill adorned with rosettes, and bearing an inscription by Nebuchadnezzar to the effect that this specimen of the founders' art was originally ten feet in length? For an extensive employment of metal, both for the construction and adornment of buildings, we must turn to the lands of Chaldæa and Assyria. To the inhabitants of the older country may be assigned the invention of the art of construction with wood and metal. Throughout the entire country both stone and timber were scarce, but the slopes of Zagros, some three days' journey from Nineveh, produced iron and copper as well as silver and lead in abundance. The skill displayed by this inventive people in masking with silver and bronze the only building materials at their command, which were ill-made bricks and indifferent timber, deserves from us a passing note of admiration. All the learning and wisdom of Chaldæa passed into the neighbouring country of Assyria. And here the architect seemed to be equal to the occasion. He covered the rough cedar beams with metal, and he masked with plates of bronze the trunks of trees that supported the flat roofs of his buildings. His doors were glittering bronze, with rich and varied ornamentation, and touched with gold; and jambs and lintel completed a design of surpassing richness and magnificence. Among the remains that have come down to our own time, none are more instructive, either as works of art or of manipulative skill, than the Gates of Balawat, made for Shalmaneser II., about 850 B.C., and now in the British Museum. A description of this work, composed of plates of beaten bronze, was published a few years ago by the Society of Biblical Archæology. The descriptions of Babylon and Nineveh which have been handed down to us and traced from authentic sources read more like pages from *The Arabian Nights* than the note-book extracts of old-world travellers. "The "palaces of the Kings of Babylon," says Philostratus in his life of Apollonius, "are "covered with bronze, which causes them to glitter in the sunshine. The chambers "of the men and the porticoes are decorated with silver, with beaten and even with "massive gold." "I have covered with gold the roof of Nebo's resting place," says an inscription by Nebuchadnezzar translated by Lenormant. "The beams of the "door before the oracles have been overlaid with silver. The pivot of the "door into the women's chamber I have covered with silver." "There is a "great brick edifice in Babylon," says another author, "which had a dome repre-"senting the firmament shining with gold and sapphires." The use of metals applied to buildings in the adjacent country of Persia appears to have been restricted to covering their brick and timber construction with thin plates, sometimes adorned with work in *repoussé* and inlays of gold. We are told that even the roof tiles of the palace at Ecbatana were covered with thin laminæ of precious metals, a taste that has descended to the present day, as exemplified in the gates of the mosque at Ispahan,

which are covered with laminæ of silver adorned with inscriptions and arabesques in gold.

The skill acquired in these countries in the handling of such materials extended to the modelling of the human form, though it may be accepted as a certainty that the forging of metals for such purposes preceded any process of casting in moulds.

It is to the Egyptians that we turn for the earliest artistic representatives of the human face and form, as well as for a more intimate acquaintance with the treatment of metals by inlays. Like the Chaldæans, they began by using pure copper, which was easily obtained, though they were long ignorant of the fact that by an admixture of a little tin its hardness could be enormously increased. So common must bronze have been at a very early period, that when some of the pavement of the Temple of Rameses III. at Medinet-Osiris was taken up, more than a thousand brazen statues of Osiris were found beneath it. Among the metals in common use among the Egyptians was *asimu*, or electrum. We learn that the obelisks of Queen Hatshepsu at Karnak were covered with it, and, as the inscription informs us, "they were visible from "both banks of the Nile; and when the sun rose between, as he came up from the "heavenly horizon, they flooded the two Egypts with their dazzling rays." The passion for the employment of precious metals was greatest during the reign of the Ramesides, and was carried to such an extent, that we read of the doors of their temples and of whole obelisks being covered with plates of gold, forged with hammer and anvil.

The wealth of knowledge and skill in the working and use of metals by these ancient peoples does not appear to have attracted the inhabitants of Judæa during any period of their career, and in testimony of the dearth of skilled metal-workers in the land, we learn from the book of Samuel that "There was no smith found throughout "the land of Israel." The prophet's lament was uttered in a time of distress, and there is little doubt that the ignorance of the Israelites in this respect was the cause of their defeat by the better-armed Philistines. This want of enterprise in maintaining so important an industry is somewhat remarkable when we consider the magnificence of Solomon's kingdom, and the gorgeous splendour of his rule. But we must remember that at that period of Jewish history the Phœnicians had at their command the commerce of the then known world, and could give in exchange for Solomon's gold not only all the materials he required, but could place at his disposal the most skilled hands from every country. "And Solomon sent and fetched Hiram out of Tyre. He "was a widow's son, ... and his father was a man of Tyre, a worker in brass; and "he was filled with wisdom and understanding, and cunning to work all works in brass. "And he came to King Solomon, and wrought all his work. For he cast two pillars of "brass, of eighteen cubits high a-piece: and a line of twelve cubits did compass either of "them about;" and, after enumerating all the parts of the construction and the fittings of the Temple, we are told that "in the plain of Jordan did the king cast them, "in the clay ground between Succoth and Zarthan." [1 Kings vii.] The resources of the men who cast, and chased, and worked these masses of brass and silver, and even

of gold, that Solomon demanded for the glory of the house of God, must have been equal to our own, though the methods may have been different. Bearing in mind that the date of these manufactures was a century before the birth of Homer, and a century and a half before the fabled building of Carthage by Dido, we can read the pages of such early historians as Hesiod and Homer without a doubt that what they described so graphically was that which they had seen in the course of their wanderings.

> The walls were massy brass; the cornice high
> Blue metals crown'd, in colours of the sky;
> Rich plates of gold the folding doors incase;
> The pillars silver, on a brazen base;
> Silver the lintels deep projecting o'er;
> And gold the ringlets that command the door.

"It has been granted only to two nations," says Mr. Symonds in his beautiful treatise on the Renaissance in Italy, "the Greeks and the Italians, to invest every "phase and variety of intellectual energy with the form of art." Among the earlier and even the later Greeks, the application of metals to decorative purposes was of a restricted nature. We know that discs of glittering copper and gilded bronze adorned their temple fronts, and that metals were generally only used where marble failed to lend itself to their requirements. Their noble use of marble, far in excess of any people either before or after, cast into the shade the smaller works in metal, but shared with them the impress of the same inborn genius and love of the beautiful.

It is not within the scope of this short introductory Paper to follow step by step the methods pursued by each civilising race, from the time when Imperial Rome gathered into the network of her vast rule almost every nation under the sun, exercising an influence upon art that is likely to remain throughout all time. Copper, and bronze, and precious metals were mere playthings in the hands of the Roman, and marble and alabaster lent themselves to his needs, as bricks and stone have done in later times. The traditions associated with the casting and fashioning of metals that had been maintained in Assyria and in Egypt for so many centuries were strengthened in his hands by an increased love of art, and furthered by a desire on the part of a wealthy community to possess objects of beauty for the adornment of their houses. During the long period when the so-called Byzantine and Romanesque styles prevailed, we note a continuance of the same methods, an extension of art-knowledge, but an absence of invention or originality. By far the most beautiful works of this period had their origin in strong religious sentiment, but they belonged rather to the jewellers' and goldsmiths' arts than to those which appertained more especially to structural adornment. We may, however, acknowledge, as Pugin acknowledged in respect of mediæval artists, that the same principles of suiting the design to the material and decorating construction were strictly adhered to in all their productions in metal, whether precious or common.

It was not till the dawn of the æsthetic Renaissance, when the genius of Niccola Pisano breathed new life into plastic art, and determined the direction of both sculpture and painting, that we can trace the germs of any new departure in the application of

metals. The art of casting in bronze had apparently not made much progress, for when Hildebrand, in 1073, ordered the gates of St. Paolo at Rome to be made at Constantinople, we may assume that the traditions of the art had not yet travelled so far westward, although we are told that the bronze gates of the cathedral at Augsburg and the magnificent tomb of Rudolph at Merseburg were made in Germany at that period. The Byzantine character of both these works indicates the importation of Byzantine artists into Germany at the commencement of the eleventh century by the Emperor Henry II. In France such work as the bronze gates of the Church of Saint-Denis suffices to show that the art of casting was familiar in that country at least as early as the twelfth century. To trace the progress of the school founded by Niccola Pisano, who may be regarded as the father of Italian art, or to enumerate the works of Andrea and Giovanni Pisano, of Orcagna, Ghiberti, Filarate, Donatello, or Verocchio, down to Sansovino, who flourished towards the middle of the sixteenth century, closing with the honoured names of Cellini and Torregiano, would be the history of metal-work during the three most stirring centuries of the Christian era. It is gratifying to us to think that most of these masters in art were architects at a happy period in the world's history, when architecture was regarded as the art *par excellence* to which all others were kept subordinate. As chief of the artists, the architect designed the work and all connected with it, and selected the subjects which painters and sculptors were to execute under his direction. With the name of Peter Vischer, who carried into Germany the Italian manner at the commencement of the sixteenth century, and whose genius enriched his country with numerous works in bronze, the era of the Renaissance may be said to have closed. At length came the day of the Reformation; Bernini and others attempted a revival, but the spell was broken, and the dry bones of art refused to be re-animated into life.

The English Revolution, unlike that which occurred a century and a half later in France, effected nothing for the goldsmith or metal-worker worth recording; and the Restoration brought with it but a few works of note, the most conspicuous, perhaps, being the brass statue of James II. in Whitehall Gardens. The revival of Greek architecture, when the architect and the sculptor should have gone hand in hand, and given us something more than the mere skeleton of the work they were supposed to imitate, is a blank in the history of applied metal-work, and the Gothic revival which succeeded gave us little more than a few improved patterns of gas standards and altar rails; but these revivals enriched our literature with many valuable works on every known branch of art metal-work, and thus contributed to those developments of the industrial arts which are so noticeable at the present time. The spirit which animated the designers of such noble monuments as that of the Elector Frederick at Wittenberg and the tombs of Everard and Geoffrey d'Eu, Bishops of Amiens, and others too numerous to mention, had passed away.

The lessons to be learnt from a study of past history are of little practical value, unless we can bring them in touch with the requirements and conditions of modern life, and, availing ourselves of the resources afforded by scientific investigation and

more extended knowledge, turn these lessons to account for the benefit and delight of mankind. The rude implements and resources of the men who aided Hiram of old to cast his bronze and his silver on the plain of Jordan would compare unfavourably with the scientific appliances at the command of the distinguished craftsmen who are to enlighten us this evening on the subject of recent methods and processes, and, what is equally important to us as architects, to show the capabilities of the art-worker of to-day as our friendly auxiliary in the adornment of buildings. We know that those methods and processes, subject to almost daily improvement, are equal to all the demands of the community, and our constant intercourse with workers in every material that claims the attention of the architect as a designer of buildings, gives us some insight into capabilities which will not suffer by comparison with any previous generation in any country.

Alex. Graham.

THE PRECIOUS METALS.

Mr. President and Gentlemen,—

HAVING been honoured by you with an invitation to read a short Paper on castings in precious metals in relation to Architecture, I must confess that I am greatly perplexed as to what to say. In my distress I ask whether you are in the habit of having capitals and bases of pillars and columns, of having friezes and panels and other architectural parts of buildings, of having doors and hinges cast in the precious metals—cast in gold and silver. You are not in the habit of doing so ; and I believe, if I were to go round to all the brethren of your profession, the reply would be pretty much the same.

I have worked a great deal in gold and silver for the late William Burges ; but, notwithstanding what some consider his eccentricities for metal-work, his coil-cases were cast in brass, his doors were wrought, and his figures were cast in bronze, and what there was silver on them, faces, hands, &c., were hammered and not cast. Unable, therefore, to refer to structural, to main features of architecture cast in precious metal, I must pass on to those of furniture, of decoration, and to articles of use. Here gold and silver were used at all times, and are used to this day. Thrones and chariots of ancient Egypt were made in gold, and so were some of the Assyrians', Babylonians', Hebrews', Greeks' and Romans' ; their temples and abodes were adorned with golden images, lamps, tripods, mirrors, bedsteads, couches, and chairs, and many a wall and pillar were resplendent with gold and silver. We read of vases of immense size, and drinking-bowls so heavy in metal as to require several men to lift the same and pass from mouth to mouth. Reading the description of these, and examining those left and collected in museums, the foremost interest is excited by their style, design—*i.e.* combination of straights and curves. By their architecture we divine

their age, their makers, their home, and through it we can divine and judge their owners' habits, customs, imagination, and morals. It is these architectural details that captivate our love for old work, and for following up conventional treatment of man and beast, of flower and scroll-work.

Having, however, now to contemplate the casting in precious metal, let us examine which parts of such a work are cast, as against parts made of hammered plate, mounted together of various pieces, with piercings, filigree-work, and other decoration by hand; and carefully studying this, one will feel surprised to find how little of it is cast, and how small the legitimate use for casting in precious metal really is.

I am very sceptical to believe in these thrones and chariots, in these bedsteads and tables being cast in solid gold and silver, but think that in most cases their main structure consisted of wood, ivory, bronze, &c., overlaid with thin plaques of hammered and embossed gold and silver. The intrinsic value of the precious metals in olden days was enormous, and out of all proportion with our present standard of comparing values; and at a time when silver coins were struck out of silver as thin as tinsel, it is rather difficult to believe in the locking up of vast values in such sumptuous furniture, cast either solid or hollow of great thickness. Of course, exception must be taken for those castings created for no other reason and purpose but for and to prove accumulation of wealth, and where precious metal was poured into shape to be hoarded up in treasuries, to be transformed again into other shapes as convenience and necessity would dictate. They were in ancient days the bars and bullion of the present.

Exception must also be made of the works of sculptors who, by the unfortunate fad of a king, were compelled to have their work, perhaps the outcome of the highest development of mind and genius, cast in precious metal, to be ransacked and destroyed again at the next war or reverse of fortune. *This* category of casting, into which we have to include bells, does not interest us here; it is *sculptor's* work reproduced in metal of some kind or other, and it is purely accidental whether bronze, base, or precious metal is poured into the prepared mould. And it is very doubtful whether a good work of art will not rather suffer in its contemplation, by its costly material clamouring for recognition.

But apart from its intrinsic value, the quality of the heavier cast silver and gold work is very inferior to wrought-work, and is as much beneath it as cast-iron is compared to wrought-iron. Cast silver and gold are porous and brittle; their molecular parts are ranked close to each other, but, examined with a microscope, there is a vacuum between the crystallised particles that allows the atmosphere to enter, oxidise, and corrode the metal; whilst in wrought metal the cast ingot is hammered over, the pores become closed, it is stretched to great length, its particles, thereby welded to each other, made tough, ductile, and elastic, and its surface prepared to offer a hard, close, firm resistance to atmospherical influences, and against wear and tear.* Silver

* Pompeian silver.

plate unearthed at Pompeii and elsewhere retains its springy nature in the parts made of hammered metal, whilst those parts of cast silver prove fragile. And yet there is scarcely a piece of enriched silver-work or gold-work without certain portions being cast. Which are these, and what is the legitimate use for casting?

These are found, *first*, as what constitutes high-relief *sculptured* work as apart from low-relief *repoussé* or engraved work; that is, of all such parts which would first be modelled in clay or wax, or carved in wood and other material, and which, to work by hand, would mean not only a great deal of costly and tedious handwork, but also necessitate a number of solder lines, as the work would require to be worked in sections and joined afterwards. Thus a figure or animal of, say, 4 inches high, with legs and arms or wings projecting, would be cast. *Secondly*, there are the *decorated* mouldings, with patterns that repeat, and all such parts which, for *giving resistance*, as legs and supports, require greater thickness of metal than can easily be worked out of beaten metal. *Thirdly*, there are the number of *repeating* ornaments, perforated borders, panels and crestings, of which a few copies only are wanted, and where it would not pay to engrave a steel die for stamping. A figure 18 inches high, however, would rarely be cast, particularly when modelled in high relief and open at the back. This would be embossed out of thin plate, as a whole or in sections, and joined together by heat and solder, or nailed or fastened down on to a wooden or other foundation. The idols, furniture, and walls of the ancients were thus made golden—in Byzantine art it was freely used; and some of the recumbent figures on the tombs in Westminster Abbey were covered by beaten plates, and to this day numbers of crosses and screens are treated in the same way.

I need not explain here why precious metal is not cast in its pure and soft state termed "fine," but used in its harder alloys—standard silver, with 222 parts fine and 18 parts of copper, and 22, 18, and 16 parts of fine gold, and 2, 6, and 8 parts of alloys, the composition of which depends on the colour and hardness desired.

The process of casting flat work, mouldings, ornaments, is by the sand-moulds; that of hollow work, with sand cores, and by the wax process. By the latter it is easy to obtain the same thickness throughout the work, which not only means a saving in material, but also the equal resistance of all its parts in the cooling and shrinking of the poured-in metal. By sand-moulds the thickness often greatly varies, and the thicker parts in cooling often fall in or sink, which is very detrimental to the work, and in many cases impossible to correct. The process itself will no doubt be fully illustrated by the other Papers following.

Knowing which parts of the work will be moulded and cast, the designer will work with great advantage, and in many cases effect an easier and cheaper working. But castings ought not to be introduced into design merely for cheapening the same, and the more sparingly they are resorted to the better. The days are happily gone by with the better class of people to estimate silver- and gold-work by its weightiness. The lighter it is, the more careful must it be made to be strong in all its parts. It would be absurd to cast the plain parts of bowl, body, or cup, and it would be

impossible to finish it well; and if at any time it had to be gilt, the mercury would enter into its porous surface and destroy part of it.

For designing silver- and gold-work it must be borne in mind that plain mouldings do not turn out satisfactorily in cast, and for all better work they are made in flat, or turned up in sections of wrought, tough metal, and joined together. And those knowing that most of these are made by hand, do not reduce mouldings, excellent for stone and wood, into it. Examine old work—our museums are full of it—and it will be found that small mouldings giving the greatest charm are very difficult to draw, in so far as they are mostly very indistinct, and often mere repetitions of lines or combinations of squares and round wire, with now and then a hollow and a twisted wire between. The old goldsmiths had no lathes and no machinery; they filed, engraved, swaged or rolled the mouldings, and for tracery-work soldered one plate above another, with a round wire sometimes laid over it.

Study old work and get at its mysteries, and let designs be carried out under its influence, and the work, whether cast or wrought, or made under any other process, will give satisfaction, and delight present and future generations.

C. Krall.

CASTINGS IN IRON.

Mr. President and Gentlemen,—

THE process of iron-founding is as follows. Models are made by skilled model-makers, and training to this business is quite a separate one to that of a carpenter or cabinet-maker, when the models are wooden ones, which is the most usual course, at least for first models. The "draught" of models has to be studied, which means that, except when the thing to be moulded in sand is simply a flat plate, the sides of the model or any relieved parts upon it must not be squarė, or at right angles with the principal plane or face of the model, but must be slightly "stripped," or bevelled, to ease the draught from the sand.

The model is laid down on a board on the floor of the foundry, which is covered with sand, originally red, but black with use and with mixture with fine ground charcoal, which is called blacking. A cast-iron casting box is put on the board over the model, and the foundry sand is sifted upon the model, first through fine riddles, until the whole surface of the model is covered equally with the fine sand. Then the same kind of sand is again sifted over through a coarser riddle, until the casting box is filled with sand. This sand is carefully and evenly rammed with iron rammers, until the casting box is filled with this rammed sand. The box is cramped to the board, and the whole thing is then turned over and the board taken off. There then appears a sort of frame of cast iron filled with black sand, and in this the model is half embedded, the face, or what is to be the best side of the casting, being downward. The counterpart

of the "bottom box," which is what has been first used, called the "top box," is then put on, and the putting on of the sand and ramming-up process are repeated until the model is completely enclosed in evenly, lightly, and yet firmly rammed sand. The evenness of the ramming is an important matter, as if some of the sand were firmly and some loosely rammed, the casting would not be of even thickness, and other defects would appear. The making of the "gates" or channels through which the molten iron is to run into the sand matrices is an important matter, as the due proportion for supply and distribution of the molten iron must be carefully arranged. The top box is now lifted off, and the model is lifted out of the sand in the bottom box, leaving a beautiful impress of the ornament, if there be any, in the fine black sand. This is then carefully dusted over with the fine ground charcoal from a cotton bag, and the action in doing this is one of the most characteristic of the moulder's actions. The thick small cloud of this charcoal covers the moulder with fine black dust, and he may be always known when in his working clothes by the blackness of his face and of his dress. A moulder, a sweep, and a collier, however, are usually very clean men, probably because of the dirtiness of their trade, as they must wash to get rid of the grime when they get home from their work. If the casting has much plain surface, the sand matrix is often lightly and rapidly smoothed over with a steel trowel, and the small trowels, of different shapes, and as bright as silver, are specially moulders' tools. Where the surface of a casting is to be full of ornament, the model is often put in again to the sand matrix, and evenly pressed upon the charcoal dusted over the sand, to give the fine surface which you see on good castings,—which must be done with perfect accuracy of "register," to use a printer's term, as the slightest inaccuracy would blur the impress of the ornament in the sand, and the time spent in preparation would be wasted. The two casting boxes are now put together again, cramped with iron cramps, and wedged with wooden wedges to keep them firmly together when the molten iron is being poured in. This is moulding of such work as is illustrated here, and I have not touched upon large castings, such as columns and heavy machinery castings, or upon small undercut work, which is what is called "false-cored," but which is better left to the brass and bronze-founder. Casting with cores is another kind of moulding, and to make castings such as the "loop-pipe" from a radiator, quite even in thickness, sound, and with a good surface, requires much skill and patience, and many moulders good at the kind of work I have just described, cannot face this. I have thus described the process of moulding from a wood model, but if a great number of castings are likely to be required from any model, cast-iron models are made. These are carefully made straight, or even, in some cases, slightly curved on the face or the back, as the case may be, to allow for the tendency of castings to run slightly "round" or "hollow" in cooling, on account of the unequal contraction from variation in the bulks of parts of the casting. In making models, the contraction of the metal in cooling from one-tenth to one-eighth of an inch to a foot in cast-iron has to be allowed for; and of course, when first wood and then iron models have to be made, a double shrinkage must be allowed for.

Wood models are sometimes carved, or are sometimes made the groundwork of modelling in wax, or in gesso, if the effect to be obtained is wanted especially soft.

There is a very pretty process called "reversing," by which a casting of any reasonable thickness may be made from a solid block in plaster or wood; but I fear I have already been too technical in my explanations, and will not adventure this, which would be still more technical.

The iron for the casting is melted in a "cupola" or furnace, which is heated by a machine blast usually caused by steam-power. The choice of the iron for castings is an important matter, as the qualities from the same works vary, having Nos. 1, 2, 3, and 4, which denote well-understood differences in hardness, toughness, fluidity, and smoothness in the finished casting. We find that a good mixture of English irons from Derbyshire and Shropshire answers our purpose, though we should use quite different mixtures for a fine casting like one of the "fronts" here [figs. 110, 111], and for a strong casting, such as has to stand a fierce furnace fire.

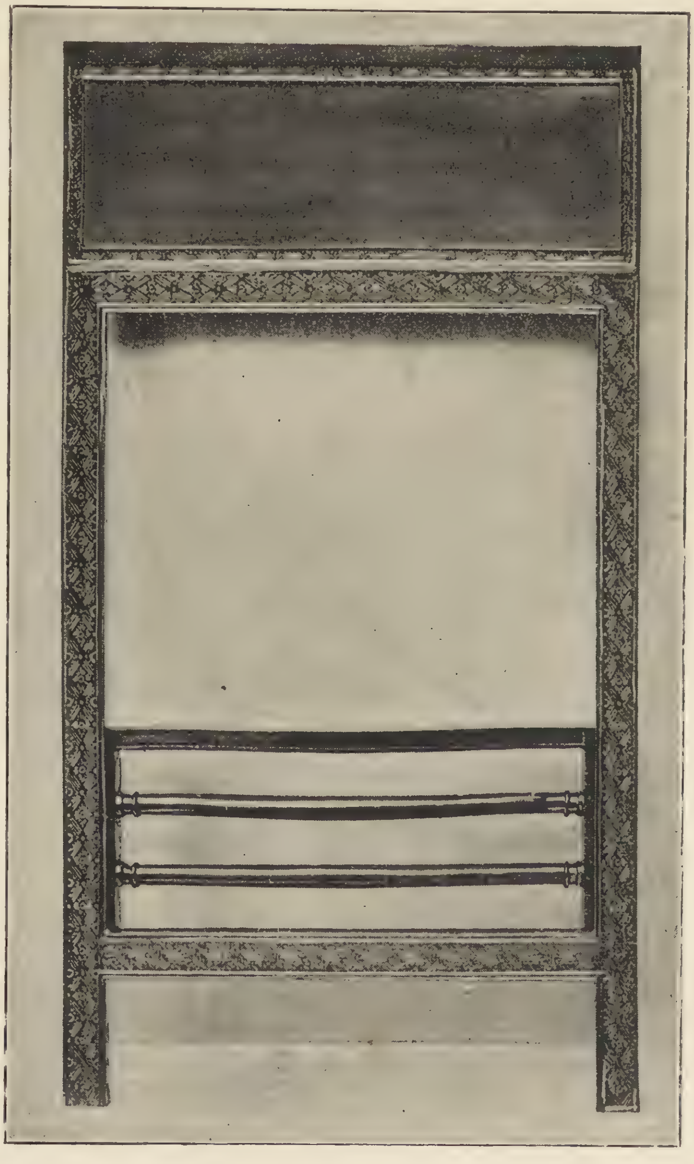

Fig. 110.—Cast-iron Front for a Fireplace.

A good quality of metal is a very important matter in castings, and is always looked to by ironfounders who understand their business. Most iron used now is smelted from the ore by "hot-blast," which is quicker in its results than the older

fashioned "cold-blast"; but when great strength and tenacity are wanted, "cold-blast" iron is used still.

When the iron is melted in the cupola—which is towards the afternoon, the moulders having been working all the morning preparing their boxes; and a good moulder requiring a considerable space on the foundry floor to contain the boxes he prepares for his day's work—the casting begins.

The furnace is "tapped" near the bottom with an iron bar, and the white-hot molten iron runs down a spout prepared for it into "ladles" of iron protected from being burnt by a daubing of sand, renewed every day. The ladles are carried by the moulders from the furnace to their casting boxes, and the surface of the metal being "skimmed," or the floating refuse from the impurities in the iron being kept back by a piece of bent iron, the molten metal is poured through the "gates" into the place prepared for it in the casting boxes. On a winter's afternoon the Rembrandt effects of the white-hot iron being poured into the casting boxes, and throwing a strong glare on to the faces of the men about, is very striking, and it is quite as well worth attempting by a painter as the forging of an anchor, which is in this year's Academy.

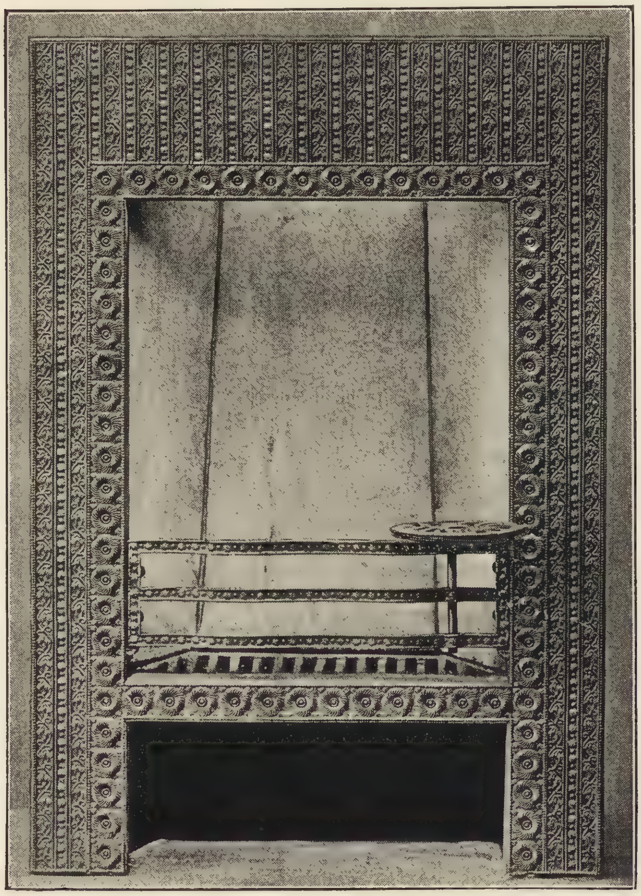

FIG. 111.—CAST-IRON FRONT FOR A FIREPLACE.

When the iron has been long enough in the sand to "set," the top box is taken off, and the casting is taken up with tongs, the loose sand about it beaten away with a hammer, and the gates knocked off; it is then reared up to cool, and left until the morning, when the day's casting is gathered together, and the next day's work begins.

In all this description I have had in my mind castings in iron of everyday use, just as they have come from the sand, showing the genuine surface not filed or ground up. Though the surface of the iron has to be covered with black—and a well black-

leaded casting has a beauty of its own—I always regret that we cannot keep the surface as it comes from the foundry.

Some time ago cast-iron fell into a certain disrepute, and wrought-iron was thought the only right kind of iron to use. This was a feeling arising out of the too exclusive study of mediæval work made before cast-iron was understood; but, with the further study of materials, it has been found that cast-iron has qualities of cheapness and usefulness, as well as of reproducing a suitable model with perfect precision and delicacy. Mr. Philip Webb was one of the first among modern architects to use cast-iron suitably, so far as my knowledge goes. He covered it with delicate ornament enclosed in rigid lines, and set a fashion which has been widely followed [fig. 111]. Mr. Butterfield, in the fine cast-iron screen, next the street, at All Saints', Margaret Street, which could not be made to stand in any other material than cast-iron, has shown how a master can treat it.

In designing for cast-iron it should be remembered that when the models are paid for, enrichment costs nothing if suitably applied. This facility for ornament, which is a dangerous temptation to the unwary, in the hands of a master produces fine effects. You may remember the finely and delicately ornamented casting for fireplaces of the end of last century, just when cast-iron was becoming a thing of everyday use. The Brothers Adam had much to do with this, though I have many examples of earlier work showing knowledge of the right treatment of cast-iron.

Ornament, if applied, should seldom rise to much relief, as one necessity of cast-iron is that the thicknesses should be equal, and high relief on the face implies deep sinking behind, and risk of the casting cracking in the cooling from the almost inevitable inequalities in thickness. A "front" for a fireplace [figs. 110, 111] must have a due proportion between its parts; the bars must be of the right plan and section; a grating must be fairly even in the thicknesses of the parts; a casting should not be enclosed with heavy mouldings like a frame—and many other rules like these, simple and reasonable, can be learnt from any competent founder. As is always the case, respect for the real conditions of the work to be done will produce a finer effect than clever *tours de force*, such as imitating wrought-iron, stone, or wood in cast-iron.

H. Longden.

CASTINGS IN BRONZE.

Mr. President and Gentlemen,—

THE subject of bronze casting is a very wide one, for this important alloy has been known from the most remote times, and the first metallic objects of which we have any record were made of it.

The metal mentioned in Holy Writ as being worked by the sixth descendant from Adam could not have been brass, although so called, but was probably

bronze. Brass can only be made from zinc (commercially known as spelter), which is supposed not to have been known to either the Greeks or Romans; but it was well-known to the Chinese, and the old East India Company imported large quantities from China. Even the ore producing zinc, called "Black Jack," was considered useless in England until 1738, so brass could not be produced until zinc was known; but as copper and tin are found in a native state, they were probably soon mixed together and formed bronze. Pure bronze is simply nine parts of copper and one of tin, but a vast number of alloys are produced for different purposes; and the Japanese are said to have quite two hundred distinct alloys to enable them to create the various patinas which they so skilfully manipulate, many of the delicate colours depending much on the alloy used, although some patinas can be produced upon almost any bronze, the French producing one difficult to detect, except by filing, on even brass.

A great deal of research has been made to discover the alloys used in ancient bronze implements of the Celtic and other periods; but so much must have depended upon the almost chance choice of materials, and the varied parts of the globe where the implements were made, that but little useful knowledge can be expected.

Tin was known from the very earliest time in this country, as Herodotus, 450 B.C., alluded to the tin islands of Britain, and the Greeks of Marseilles visited Britain for tin. The bronze chisels of the ancient Egyptians were made of a metal called "chalkos" by the Greeks, and "Aes" by the Romans, and consisted of five parts of copper and one of tin—which proportion gives great hardness—and were used by them for working the stone quarries of Egypt; and nearly this proportion is found all over Europe to be the alloy of the bronze implements of the ancients.

But although this proportion gives a hard bronze, it would not do for many of the bronze productions of the present day; thus the bronze for cannon must be very different, or it would burst; and the bronze for money must be softer, or it could not be struck; and the bronze for statues must be of a different mixture, or it would not run well in large masses. Thus the metal for cannon has 10 per cent. of tin, the bronze for money or medals 8 per cent. of tin, the proportion for statues has varied according to the judgment of the founder, and there has been a great difference in the alloys for statuary work. The brothers Keller, who worked in France in 1699, and cast the statue of Louis XIV., used for their alloy $91\frac{1}{2}$ parts of copper, $5\frac{1}{2}$ parts of zinc, of tin only $1\frac{3}{4}$, and $1\frac{1}{4}$ part of lead. Other French founders used a mixture containing only about 82 parts of copper, which would be an alloy of less value than the former; but the founders of the Renaissance generally employed a metal of good quality—and this one can understand, as in those days the sculptors were often their own founders, and so would not injure their work by casting it of an inferior metal. Another simple form for bronze statuary is to put an ounce of tin and an ounce of zinc to every pound of copper, the colour of such alloy being good, and easy to run in the fluid, which is a great consideration in large castings.

This brings me to the alloy of copper which is perhaps the most known, namely, that which forms brass; and until zinc was produced in its metallic form by Henckel

in 1721, there was no commercial brass, as the metal many term "latten," and the incised plates for monumental purposes, were very differently made. These are more of the nature of bronze, and were produced by melting copper and the ore of calamine —the native carbonate of zinc, found both in England and Ireland—in a covered pot,

FIG. 112.—BRONZE STATUE OF LORD NAPIER OF MAGDALA.
(Recently erected in Waterloo Place, London, S.W.)

and a much redder metal was the result, from the fact of its having more copper in it than our present yellow brass. The old French name for brass is "laiton"—hence our word "latten"—but the French workmen now term it "cuivre jaune," to distinguish it from "cuivre rouge," or copper. Ordinary brass has about 66 parts of copper and 33 of zinc, and for what was known as Bristol brass a little lead was added. Any

excess of zinc produces a very poor metal, and should be avoided. When latten is desired, it should be understood to be a metal with 75 parts of copper and only 25 of zinc. It is rather a doubling of words to use the expression one sometimes sees, "latten brass," as it is really saying, "brass brass" in two languages.

It may not be generally known that it is almost impossible to cast pure copper as statuary, or in any ornamental form where there is relief. The reason being that the contraction in copper on cooling is so great, that excepting as plain ingots, where even then one side is exposed, it pulls itself apart by mere contraction, from the metal on the surface of any raised or sunk part of the mould taking such a hold upon the sand and thus preventing the contraction. A red metal is produced by putting a proportion of brass as a flux in the crucible with the copper; but even then the flask in which the mould is made must be pulled apart immediately after the casting, or the work will be in pieces.

A great discovery would be to find an alloy that would give no contraction, like the metal bismuth. Bronze statuary would then be more an exact reproduction of the sculptor's model, as the present alloys contract about the sixteenth of an inch to the foot. The Lord Napier monument [fig. 112], in Waterloo Place, was cast by the sand process, and I may mention that the base of the statue is nearly one inch shorter than the model, hence it had to be released from the sand before it cooled, or it might have torn itself into two parts.

There is great room for research on the question of the contraction of metals; and if bismuth were not so expensive it could be used in the composition of bronze with advantage, as it expands in cooling, and does not injure the colour. In metal which has 1½ ounce of bismuth to a pound of bronze, the contraction is about half the usual quantity.

The subject of alloy naturally brings us to the question of solder, which is only a matter of alloy, and its history has received but little notice. The art of soldering is not so ancient as the producing of the metal, or the metal object. Thus in the British barrows—and which can only be so named from the finds in them—all the early gold-work has no solder in its construction, all joins being made by lapping the edges together. Even the Romans did not use solder in making their lead pipes in this country; but solder is used in the gold- and silver-work found in the Saxon barrows, which shows that these people had given great attention to the working of metals. To solder a pure metal like gold, silver, or bronze is now thought easy enough; but it was not so easy in the first instance, as to make solder for any particular metal you have to take that metal, and add generally about half another and inferior metal, that melts at a lower temperature, and you then have an alloy that melts quicker than the higher metal, yet of the same colour, and thus will unite the two when brought together at the melting point. Thus the alloy for gold solder is silver; for silver solder, silver and brass are used; and for bronze, a mixture with brass makes a good solder.*

* I am not aware that any one has ventured to say when solder was first used to join two metals together, and the investigation would lead to much interesting information.—W. H. S.

Having treated of the metal, it will now be fitting to speak of the casting it into any required form. The two methods of so doing are known as the "sand process," and the "cire perdue" process. There is little doubt but that the founders of early ages used the wax process, as some of the moulds for the casting have been found which could only have been formed by the wax method, being the moulds from which the wax had been burnt out, and not yet used for the bronze casting. Also in Italy it has been for ages the process chiefly used both for life-size and even colossal statues, as well as for small works. It was the method employed by Cellini in casting the Perseus; and this mode of casting was introduced by him into France, but it did not flourish in that country, and died out with the Revolution. At the present day the art has been revived, and there are one or two foundries in Paris where bronze is cast by this process. Perhaps one reason why this mode of casting has not been so much practised in France as in Italy is that a very fine sand is found near Paris, by which the very best castings by the sand process can be produced. This sand is so excellent that it is exported even to America, and in our foundry at Frome all the best work is moulded with it, its chief merits lying in its great tenacity, or the power of holding together, with very little clay in it, which most sands of this kind are found to have; and when this is so, it cracks on the necessary drying which it has to undergo when formed into the mould.

I will first briefly describe the process of moulding by the sand process. For statues of over life-size it is necessary to have a lofty foundry, so as to be able to lift the large flasks from the pit in which large pieces are cast. This pit should be at least 12 ft. square, and 10 ft. or 12 ft. deep. A crane is needed that can lift about 12 tons. A flask is also necessary, this being a large iron box in two or more parts, in which the mould is made. For a statue 10 ft. in height the flask would weigh 5 or 6 tons, and it should be constructed of plates fitting together in such a way that the flask can be increased or reduced in size to suit the dimensions of the model. The model to be cast is then placed in the flask partly filled with sand, and the preparation of the mould is commenced. The mould has been well described by Mr. Simonds as the concave or negative imprint from which the positive or convex imprint is to be obtained. The time to mould a statue depends upon the number of pieces required called "draw backs," which must be used wherever there is any undercutting. The mould of a statue now being made at our foundry has taken more than three months, and the core is only now being finished; there are about 400 pieces necessary to this model, and this number will give some idea of the difficulty and skill required for such work. The core must now be prepared, and this is a most important part of the process. What is technically termed the core may be defined as a rough copy in sand of the original model, slightly reduced in size over the whole of its surface, the difference between the size of the core and the model giving the thickness of the bronze casting. We now have the mould, with inlets for the molten metal to be poured in, and proper outlets for the air, and the core, which must be properly held in the cavity of the mould. If the core were not supported in some way, it would touch the sides of the

mould, and so prevent the metal running. It is, therefore, held in place by iron bars, so as to leave half an inch of space between the exterior face of the model and the interior face of the mould; but the space left must be proportionate to the strength required in that particular part, some portions of a bronze statue being much thicker than others. This is a work of the greatest nicety, and requires the utmost care and delicacy, as any error in placing would spoil months of work.

The model and core being now complete, they are placed in the "drying store," where they remain according to the size of the work. A statue 10 ft. in height would have to remain at least a fortnight, as every particle of moisture must be taken from them, or a serious explosion may be the result. When dry, the flask is lowered into the pit, and the molten metal run into the mould. About double the quantity of metal required for the statue itself must be cast, the difference being needed for the runners and feeders, these being the channels which convey the metal to different parts of the mould.

If everything has gone well, the metal fills up the space left for it, and we have the satisfaction of seeing it run out at the vents—a sure sign of a successful casting. The flask is then unscrewed and all the keys taken out, so as to allow for the contraction. The runners are now cut off, and any necessary mounting is done, but there should be but little work to complete the bronze statue.

For the "cire perdue," or wax process, a very different method is followed. The old process, adopted by Cellini and others of his time, was to build up the core first, using various materials for that purpose; but care was taken that the central part was not too compact, so as to allow for the escape of the gas. When this core was modelled it had all the appearance (supposing it to be a statue) of a rather lean figure, but possessing the general shape and proportion of the finished work. The sculptor then applied all over the core a layer of wax, making this skin as thick as he wished the metal to be. Of course he finished this with the utmost care, knowing that each touch in the malleable wax would be reproduced in the indestructible bronze. He had now to apply various layers of fine material and eggs, at first liquid, and gradually hardened, until the mould had become the necessary thickness. The wax was now melted out, and the molten bronze poured into the cavities which the wax had occupied. This may not seem much to do, but what hopes, fears, and anxieties are entailed may be read in the pages of Cellini's life.

Apart from the fact that sculptors would not now have the time, or probably the inclination, to go through this long and laborious process, there is the great disadvantage attached to it that if there is a failure the sculptor has to begin again from the commencement. Nowadays the plaster moulder and the bronze founder relieve the sculptor of the mechanical part of the work; and although the former may be a nuisance when he turns the studio upside down in making his piece mould, and the latter a worry when he loses some of the character of the modelling, yet it must be admitted that if evils, they are necessary ones.

The sculptor under the present system models the work in clay or wax, and the plaster moulder reproduces this in plaster, making probably several copies; one of

these is handed to the bronze founder, whose first duty is to make an exact reproduction in moulder's wax, with a core inside it. To effect this, he considers whether he shall adopt a gelatine or a piece mould, some subjects being better suited for one treatment, and some for the other. If a piece mould, the moulder lays the work down and fixes it in position by means of modelling clay, so that the lower part is covered; upon the upper uncovered part he forms his mould, shaping the liquid plaster, which is of the consistency of thick cream, into appropriate forms, which fit together like a Chinese puzzle, the whole being protected and kept together by one large outside piece. When this side is completed, he turns the work over, removes the clay, and treats it in the same way as the former one, protecting it also by an outside covering. If he elect to use gelatine, he covers the work with clay the thickness that the gelatine will be; upon this he forms two covers of plaster to keep the work steady. He then removes the clay and pours the gelatine into the place which it occupied, and a mould of gelatine is the result.

The moulder, whether he has used the gelatine, or the piece-mould process, now has a complete matrix. The next process is to form a core inside it, otherwise the casting would be solid. The first necessity for the core is the lantern, or funnel, to carry off the gases which are generated. This is the centre of the core, and is formed of an iron pipe with holes perforated in it, being attached to an iron plate which is usually placed on the plinth, which occurs in most pieces of sculpture, and is carried right up to the top of the work, and projects several inches beyond. The lantern is placed in the centre of the matrix or mould; a composition of brickdust and plaster is then poured in, which forms a core with the funnel in the middle. Some workmen prefer a sand core as being more porous, although not so strong. If this material is used, it has to be pressed into the mould instead of being poured. The mould is now taken apart, and the core is pared down to allow of a space between it and the mould just as thick as the metal should be. The mould is then again put together with the pared core inside; it is firmly bound together, and the wax, made of a particular composition varying with the season of the year, is then poured in.

We now have an exact reproduction in wax of the original model, the interior being formed by the core, which is impervious to heat. This wax is then handed to the sculptor, who removes all signs of the seams, and, if he thinks fit, gives even additional force to the work from what it had in the plaster. It is then again returned to the moulder, who proceeds to place jets around it. These are round strips of wax, which he places wherever he wants a channel for the molten metal, or for the escape of the gas.

It is now necessary to form the mould that shall form the metal. This is applied by layers of a substance which most founders keep secret. The first coating is in a very liquid state, and is painted on with a soft brush, so as to go into all the small crevices. When this is dry, another is added, and so on, until there is a tolerably thick coating all over the work. A cage-work made of strips of iron is now formed round the mould, and sand rammed between the spaces. The work is now placed in a muffle, and the wax melted out by means of gas. When all the wax is out, a larger

FIG. 113.—BRONZE STATUE OF GENERAL GORDON AT CHATHAM.

fire is made, which thoroughly dries it. The mould, still hot, is taken out, and, if necessary, placed inside an iron flask, and the metal is poured in. It now only remains to open the mould, remove the core, clean the casting, take off the runners, and apply the patina. There is another variety of this process, but time will not permit of its now being mentioned.

These are the two methods of bronze founding, and by an eminent sculptor one has been termed an art, the other a trade; but I may perhaps be permitted to say that I think this somewhat an exaggeration. For some works, and where price is an object, as it so often is in these days, the sand process is no doubt the best. The casting of the statuette of "Peace," by Mr. E. Onslow Ford, A.R.A. [fig. 114] is by this method, and I trust you will deem it a proof that good work can be done by the sand process. For other works, and where casting of the highest excellence is required, and where the sculptor's slightest touch must be retained, also when it is necessary to cast the work entirely in one piece, the wax process is the one to follow.

Fig. 114.—Bronze Statuette of "Peace."

We have upon many occasions combined the two processes in the same statue, the parts where it was desirable that the reproduction of the model should be the most accurate, such as the head and hands, being cast by the wax, and the other portions by the sand method. As, for instance, in the Gordon Monument at Chatham [fig. 113], where the head of Gordon, the tassels which form part of the trappings, and the tail of the camel are cast by the wax, and the rest of the statue by the sand process. This plan seems to have met a difficulty with regard to such work, and I am glad to say has been considered very satisfactory.

W. Herbert Singer.

ABSTRACT OF THE DISCUSSION.

Mr. J. M. BRYDON [*F.*] said Mr. Krall had told them of many processes; but he was bound to admit that the burden of his song seemed to be that there was very little casting in the precious metals at all. Still, there were instances when, in order

to save time and material, it was necessary to cast the beautiful figures to be seen on some chalices, and there they saw how skilfully the artists adapted the means to the end. Mr. Longden, as a practical iron-founder, had pointed out that in the working of cast-iron the introduction of the hot blast, in preference to the cold, resulted in a great saving of time. But that was what they did not want to save; they wanted to save, not time, but quality, and, even at the expense of a little time, to get the higher quality. Mention had not been made of Stevens's magnificent castings—magnificent in their beauty of form, in the skilfulness of their technique, and the vigour of their modelling—worthy of Alfred Stevens, one of the greatest sculptors that they had had in England. The great difference between sand castings and the wax process was that the latter gave much more intimately the touch of the sculptor himself than the former. As an architect it seemed to him almost impossible to cast a statue so well by any other process as by the wax process, for one had then the touch of the sculptor straight from the mould, without the intervention of the modeller.

Mr. ONSLOW FORD, A.R.A., said the real difference between sand casting and the wax process, from the sculptor's point of view, was that the bronze produced by the sand casting was five times removed from the original model, whereas the wax casting was only twice removed from it; and those two removes were so slight, that a casting when perfect had the appearance, even to the artist who made the model, of being an exact reproduction in bronze of the design. In the sand casting, a clay model, a plaster mould, and a plaster cast were made; the sand modeller made a sand mould, and then the metal was cast into that. But in the wax process the previous removes were done away with, and the casting was delivered back in wax, which the sculptor retouched, and so made it again into a first-hand work; and then the bronze was cast. Mr. Singer had expressed a hope that, in time, castings would be produced as good as those of the fifteenth century; but, in his (the speaker's) opinion, Mr. Singer had already produced castings as fine as any that had been executed at any time of the world's history. Bronze, moreover, was much cheaper than marble. The same bust, carved in marble and also cast in bronze, would cost in marble (including material and labour) from 35*l.* to 50*l.*, whereas in bronze it would cost from 20*l.* to 25*l.*

Mr. GEORGE SIMONDS said that although, on many occasions, Cellini and others adopted the very laborious and risky process of first modelling the core, and then making their wax over it, afterwards covering it with a mould, firing and casting it, they were perfectly well acquainted with the process of making a piece-mould, and they had the replica of the original work to fall back upon in case anything went wrong. Cellini himself gave a long description of both processes; and reference had been made that evening to casting work by the two processes combined, which was a very important thing, and, so far as he knew, Mr. Singer was the first who had done it. It seemed an obvious thing to do when they were making a large statue for outdoor purposes—or, indeed, for indoor purposes—because in such cases it was obviously a great waste of time and expense to use the "cire perdue" process throughout. In the statues that they put up all over England it was not worth while to cast a man's

frock-coat by the "cire perdue" process; but it was worth while to cast his head and hands by that process, and he (the speaker) had had the heads and hands of statues back to his studio to retouch with wax. He endorsed Mr. Ford's commendation of Mr. Singer's castings.

Mr. J. STARKIE GARDNER thought, referring to Mr. Graham's Paper, that metal was originally cast and not beaten. All the metal found of prehistoric date was cast-metal; and, so far as they knew, it was all cast by something approaching to the sand process. It seemed to have been cast in a mould of rather porous stone, which, of course, in the case of those simple castings, was equivalent to the loamy sand now used. In the days of Charlemagne, the Germans were certainly able to cast their own brass; and the castings at Aix-la-Chapelle, as a case in point, appeared to be of native production. Cast-iron was much appreciated during the Renaissance, and he doubted whether Inigo Jones had ever used anything but cast-iron, for he could not find examples of wrought-iron in any of that architect's buildings; and Wren used it for St. Paul's, not because it was cheaper—for the railing cost 12,000*l.*—but because it was the very finest thing he could put there. No wrought-iron railing could be put round St. Paul's Churchyard that would look so noble and dignified as that cast-iron railing. When properly used, cast-iron was not a brittle substance; it was only when one tried to do too much with it that it failed. With regard to the "cire perdue" process, the equestrian statue of Louis Quatorze (destroyed in the Revolution), which was between twenty-two and twenty-three feet high, and which weighed 83,000 lbs., had been cast by that process, which showed that the French did not by any means lose the art after the Cellini influence had died out. That statue was cast by the "cire perdue" process, not because there was any marked preference for it, but because it was just as cheap as, and much more satisfactory than, the other; and he did not see where the great difference in expense came in, except that they had a lot of men trained to do piece-moulding for established wages, while they had no men trained to do the wax process. For small things, and where there was only one required, the wax process should certainly have the preference.

Professor AITCHISON, A.R.A. [*F.*], thought, with Mr. Gilbert, the sculptor, that they made a mistake in using bronze so little in architectural work, and that where ornament was to be frequently repeated, it could be modelled by a good sculptor, and produced in bronze at a less cost than it could be carved in stone. He happened to have had some internal work to do, of which all the capitals of a certain part were alike; and he had used bronze for the purpose, at a lower price than for similar capitals carved in mahogany. Bronze stood well in any climate; though it got ink-black in London, it preserved its form. The objection to its use for the highest work of fine art—the undraped human figure—was that, although almost imperishable, it was melted down in times of trouble; for several of Michelangelo's statues had been turned into halfpence or into cannon. Though they knew a good deal about cast-iron, they did not make nearly the use of it that they might; and he looked forward to a time when it would be used by architects to a very much greater extent than it had

been. He looked forward to the architecture of the civilised world being entirely modified by its use. When brick, stone, and rubble were almost the only materials to be had, it was necessary that arched and domed forms should prevail; but now that they had a material that was enormously stronger in cross strain than stone or marble, it seemed to him that architecture would naturally take the form of the old post and lintel of the Greeks. Although cast-iron could not be cast with the perfection of bronze, and could not be perfectly chased, still, when used on a large scale, it was obvious that in a thing removed many feet or many yards from the eye, elaborate fineness was absolutely thrown away. Where columns fifty or sixty feet high were used, it certainly seemed unnecessary that they should have the same perfection in finish as would be required were they close to the eye. Metal working and casting seemed to have a peculiar interest for mankind; their history had enriched the literature of all countries, and he was sure that there were few present who had not read the entrancing account given by Benvenuto Cellini of the casting of his Perseus.

Mr. H. H. STATHAM [*F.*] wondered how many centuries might be allowed for the life of a cast-iron building. He had once asked Sir Benjamin Baker how long the latter expected the Forth Bridge to last, and he said that with proper care he did not see why it should not last five centuries. Now, mild steel would probably last a good deal longer than cast-iron, but even five centuries was a very short life for the old-fashioned architecture of brick or stone. Therefore, if they ever had a cast-iron architecture, farewell to the old monumental duration of buildings.

Mr. WM. WHITE, F.S.A. [*F.*], thought that many things ought to be in wrought metal rather than in cast metal, if they were to show any individuality of design or of structure. For larger things, that had to be repeated on a large scale and show their repetition at once, the use of cast metal was legitimate.

XCIX.

THE BURLINGTON-DEVONSHIRE COLLECTION OF DRAWINGS FORMERLY PRESERVED IN THE VILLA AT CHISWICK, WITH A NOTICE OF THAT BUILDING.

By William H. White, *Fellow*.

SOME forty-six years ago, the Honorary Secretaries then in office drew up a Note on the celebrated "Collection of architectural drawings, by Andrea Palladio, "in the possession of the Duke of Devonshire, at his Villa at Chiswick, near "London," which was read at the General Meeting of the Institute held on the 17th November 1845. Ambrose Poynter and Professor Donaldson reported that these drawings were contained in portfolios and books of folio size, bound in russia or morocco leather. Their words were:—Those in the portfolios are all mounted, apparently on foreign boards, and many of the sheets having sketches on both sides are attached to the boards at one end only, so as to leave the back free for inspection. Many of the drawings have the lines in bistre, and some are shadowed with finely drawn lines; others with a wash tint. They are of two classes, either sketches from original monuments, or designs, having dimensions and memoranda upon them; or drawings fairly made out, many of which are probably by another hand, as several are purely elementary drawings of the Orders or plans of temples, sepulchres, and other edifices, most likely prepared for publication. The memoranda are written in a cramped Italian character of the period, with frequent abbreviations, and peculiar orthography. There is not the signature of Palladio on any one of the drawings. Some have the name of the edifice to which they relate, others have no indication of the object they are meant to illustrate. Those which may be presumed to be by Palladio himself, amount to about two hundred and fifty.

The Report continued with a description of some of the contents of the portfolios, seventeen in number, seven of which contained drawings of the Baths of Constantine, Vespasian, Nero, Titus, Diocletian, Antoninus (Caracalla), and Agrippa, all in Rome. With the last-named, in Portfolio VII., was included a bird's-eye view of Rome, dated 1562, showing the city prior to the erection of the present St. Peter's. In 1852, Mr. Edward Falkener made notes of the subjects of some of these drawings, in a

MS. Paper, dated 7th July 1852, which is appended to the proof of the original Report and preserved in the Library.

In the course of the current year (1892), when arrangements were being made to remove this collection from Chiswick to Chatsworth, the Duke of Devonshire (better known as the Marquis of Hartington) was asked to lend the drawings for exhibition at the Institute; and it is with his Grace's permission that a very careful examination has been made of them. Mr. Wyatt Papworth and Mr. J. D. Crace—to the latter of whom the Institute is especially indebted for aid in the first instance—assisted by the notes of subjects presented by Mr. Edward Falkener, have compared the drawings in the several portfolios, with the original description given in 1845. The more important of the measured drawings of ancient edifices, besides those of the great Thermæ* in Rome, are plans, sections, elevations, and details of the Amphitheatres at Pola and Verona, and of the Coliseum; of some ancient theatres; of the Temple of Fortune at Præneste, and of numerous temples in Rome and other parts of Italy; of the Pantheon (in addition to the sketches of it pertaining to the drawings of the Baths of Caracalla); of the Piscina Mirabilis near Misenum; of the Tomb of Theodoric near Ravenna; of the Villa Adriana near Tivoli; of the Portico of Pompey; of a Septizonium; of the Baptistery of Constantine; of the Arches of Janus, Septimius Severus, Gallienus, and Constantine; of arches and gates at Verona, at Susa, and elsewhere; of doorways at Spoleto and at Spalato. Other drawings, which relate more immediately to Palladio, are studies for palaces and villas. There are also drawings of palaces by him at Vicenza, such as the Chiericati, the Tiene, &c.; an elevation, by Gian-Battista Albanesi, of the Scene of the Teatro Olimpico at Vicenza, with a copy of this drawing, and another of the same Scene with modifications; a section by Antonio Vicentini through the court of the Convento della Carità at Venice; a plan of the Rochetta di Vicenza; plans, elevations, sections, and details of the Villa Madama and other Villas, with those of many buildings of a like character.

Mr. Wyatt Papworth notes, in reference to two bound folios of drawings, which were forwarded at the same time by leave of the Duke, as follows:—

A bound volume endorsed with the words, "Heathen Temples, Plans, and "Drawings," but apparently they are not by Palladio. It contains plans, elevations, sections, and sketches of temples and tombs, principally circular. The following among others are inscribed in Italian: Temple of Vesta (octagonal); Temple of Neptune, at Pozzuoli; Temple of Lucina and Juno; Temple of Apollo, near Benevento; Temple of Bacchus, now Sant' Agnese; Temple of Mars, in the Campagna of Rome; the Pantheon, at Rome. There is also a plan of "S. Pietro Montorio," and there are plans of buildings "a Tivoli," "presso di Costantinopoli," "in Venezia," "in "Palestrina," and a palace "di Augustyn Gisi in Transtevere." The majority, however, are without titles or any memoranda.

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* See, in the British Museum Library, the work, of which only a few copies were printed, published at Lord Burlington's expense, entitled "*Fabbriche' Antiche' disegnate' da Andrea Palladio Vicentino e date in "luce' da Riccardo Conte' di Burlington.*" Fo. Lond. 1730.

A thick folio volume, endorsed "Drawings—Public Ornaments—Arches and "Bridges." It consists of seventy-two leaves of drawings by various artists, among whom occur the names of Giulio Romano, Caravagio, Le Poussin, Alessandro Algardi, Giulio da S. Gallo (1465), for the Libreria Barberini at Rome. Among them are three of figure subjects; six richly decorated ceilings, apparently French, with the letter "L" appearing in the panels; screen walls with statues in niches; fountains; archways; vases; a drawing entitled in English, "The original Drawing for ye little but "beautyfull Temple of St. Pietro Montorio in Rome," by Bramante; tombs; Raphaelesque ornament, pilaster, and friezes; armour; wall decoration; and five sheets of sketches of designs for palaces in Vicenza and neighbourhood.

A bound volume of *Vitruvius*, folio, Como, 1521, by Cæsare Cisarano, with MS. notes.

A bound volume of *Architettura di Andrea Palladio Vicentino*, folio, 1740, Venice; Italian and French text, "con le osservazioni dell' Architetto N.N."; the plates inscribed "Georgio Fossati, Arch. inc[t]"; a rare edition.

A bound volume of *Vitruvius*, quarto, Venice, 1567, by Daniel Barbaro, of great interest because it contains numerous notes in the handwriting of Inigo Jones, as stated at the end of it, in the handwriting of Lord Burlington.

Referring to the four boxes, each of which is full of drawings, Mr. Falkener notes that they are chiefly by Inigo Jones, John Webb, and other Englishmen. Mr. Papworth adds: There are numerous scenes for masques, probably the work of Inigo Jones; a title-page for a work, by Israel de Caus; Cagliari Cathedral; St. Paul's, 1637,—a poor doorway; Screen at Winchester Cathedral; a ceiling for Wilton, 1649; York House Water-Gate, 1641, plan, elevation, and section; the Lodge at Sherborne; scroll-work for Wimbledon; Temple Bar, brickwork construction, 1638, signed by Inigo Jones; an elevation, 1636. An entrance tower of three floors also signed, and another dated 1616. Drawings, Weybridge, for Lord Lincoln; Belvoir for Lady Pulteney; Hatton House, 1622–3, and others. Drayton, 1653, John Webb, bedchamber chimney-piece. Gunnersbury, 1658, John Webb; together with numerous plans, elevations, and details of the first portion of Greenwich Hospital, with interior decoration for the king's apartments, signed or initialed by Webb. Two elevations of "Cronenberg "Castle," signed F. Stuhlmann, Ingenieur.

Not the least interesting of the drawings which may be attributed to Palladio are those of the Theatre and Naumachia of Verona. They were described, and in part reproduced, in an article on the Theatres of Vicenza and Verona [*The Museum of Classical Antiquities*, vol. ii. No. vi.—June 1852], by Mr. Edward Falkener, who states that he "had the good fortune to discover them in the magnificent collection of "original and unedited drawings by Palladio in the possession of the Duke of Devon- "shire;" and that the Duke had permitted him to copy them for insertion in the *Classical Antiquities*. Mr. Falkener also described his visit to Verona in 1849, some four years after Pinali published a description of the later excavations commenced by Andrea Monga in 1836 over the whole ground occupied by the theatre; and he gave most interesting particulars of the discoveries then made. "It is to be regretted," he

wrote, "that the plan of this theatre as given by Palladio is very imperfect, probably "from the vestiges above ground not being sufficiently entire, even in his time, to enable "him to take his measurements with any certainty. It is drawn on the back of one "of the other drawings, and looks like an unfinished sketch." Mr. Falkener further contributed a description, with illustrations, both of the "Ambulacrum Pensile" and the "Naumachia," which latter was a basin of water between two bridges, Marmoreus and Æmilius—the former bridge having obtained its appellation, not from its masonry, but because it was ornamented with a marble colonnade, which, added Mr. Falkener, was probably that built by Theodoric, for communication with his palace.

More than one drawing of bridges with colonnades of the kind exist in this Collection; but, apparently, little or nothing has been preserved of the Villa near Vicenza, designed by Palladio for the Marquis Capra,* which has served as the model for numerous villas of a similar description, not only at Chiswick, but also in various parts of Italy and France—the plan of the original Château of Bagatelle, near Paris, which was altered and spoilt by that Marquis of Hertford who lived there until his death in 1870, having been founded upon Palladio's celebrated building; not to mention the Château, long since destroyed, of Marly-le-Roi, erected for Louis XIV. by the architect, J. H. Mansart, in 1676, which, like everything French of that time, was an improvement, suited to national habits and tastes, on the original Italian model. Indeed, the Indian bungalow, with its compound or *campagna*, may be considered of the same type, though it is generally devoid of the low basement storey which adds to the beauty and healthfulness of both the Villa Capra and Chiswick House. Drawings are preserved of the latter building, comprising plans, elevations, sections, &c., in Indian ink, and to a scale of just double that of the reproductions here given [figs. 116, 118, 119, 120, 121]. As was the custom of the time, chimney-shafts are conspicuous in the elevations and sections by their absence, though eight fireplaces are shown as useful and ornamental features in six of the rooms on the main floor; and a similar reproach may be directed against all the designs, of which drawings are preserved, made by Kent and others under the guidance of Lord Burlington.

One of the modern curiosities of literature is a statement in the second edition of the *History of Modern Architecture* (8o. Lond. 1873),—a statement which has been allowed to remain in the third and enlarged edition recently published,—that "Perhaps the "most successful of *Jones's* smaller designs is the one he furnished for the Duke of "Devonshire's Villa at Chiswick . . . suggested by that of his idol Palladio at Vicenza." Again, in the same paragraph, "*Jones* improved the form of the dome [referring to "the Villa Capra, which was the model selected by Lord Burlington], and he added "only one portico, which, in fact, was necessary to suggest the design; and he so "modified the elevation of the three remaining sides as to make them elegant and "appropriate façades for an English nobleman's villa." Fergusson thus appears to

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* The plan, elevation, section, and details of the Villa of the Marquis Capra, near Vicenza, are given in *Les Bâtiments et les Desseins de André Palladio recueillis et illustrés par Octave Bertotti Scamozzi.* Fo. Vicenza, 1786. Vol. ii. 2nd ed. [In the Library.]

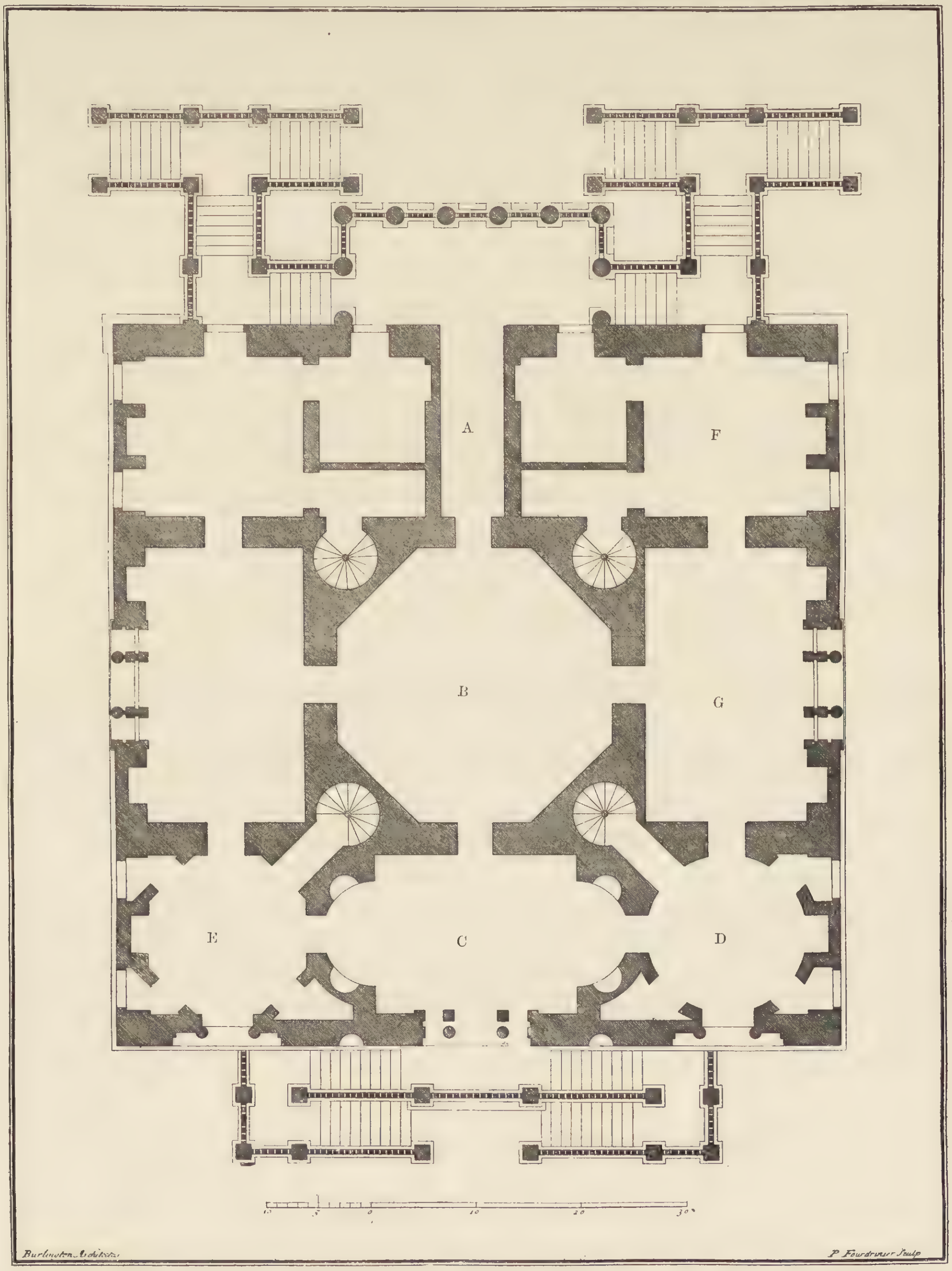

FIG. 115.—PLAN OF THE EARL OF BURLINGTON'S VILLA, AT CHISWICK [see figs. 120, 121, 122].
(Reduced from a print in the Collection.)

have thought the plans, &c., published in 1744 under the title of *Some Designs of Inigo Jones and Mr. Wm. Kent,* and republished in 1835 as *The Designs of Inigo Jones,* &c., were solely those of Jones; and to have ignored the fact that the Earl of

Burlington, in whose lifetime the Villa therein portrayed was erected, was not born until some forty-three years after the death of Jones—the great architect having died in 1652 at the age of eighty, and the Earl, his studious admirer, having been born in 1695. Fergusson, moreover, placed the Chiswick Villa almost in the same category of English Renaissance works as the Banqueting House at Whitehall, and St. Paul's Church in Covent Garden. Neale, in *The Seats of Noblemen and Gentlemen in England*, &c. (second series, vol. v., 1829), gives two views of Chiswick House as it

FIG. 116.—FRONT ELEVATION—THE PRINCIPAL ENTRANCE.
(Reduced from an original drawing in the Collection.)

appeared in his day, stating that it is "situate about six miles west of London," and that "a winding road through a young plantation, of nearly a mile in length, has "been recently made from Turnham Green." According to him, the site of the Villa was occupied by a house erected at the beginning of the seventeenth century, which was pulled down in 1688 by the first Earl of Burlington,* who had purchased

* This was Richard Boyle, second Earl of Cork, who was made a peer of England in 1644, as Baron Clifford of Lanesborough, co. York; and who in 1664 was created Earl of Burlington. Dying in 1697, he was succeeded by his grandson, who in 1703 was succeeded by his only son, Richard Boyle, fourth Earl of Cork and third (otherwise last) Earl of Burlington, who was born in 1695 and died in 1753. The only surviving

it three years previously, and who died in 1697; adding that the Villa built by the celebrated Earl (namely, the third) was erected in 1729.

Among the drawings is a section, to a large scale, of room F [figs. 115, 121], and note may be taken of the fact that the section through the central hall [fig. 118]

Fig. 117.—View of the Entrance Front. (From a recent photograph.)
The statue is of Inigo Jones, and on the other side, in the corresponding position, is one of Palladio.

is shown without the decorations which appear in the print of the same hall published in the 1835 edition of Kent's book (vol. i. pl. 72). The character of that ornament

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daughter of this, the celebrated Earl, married the fourth Duke of Devonshire; and thus the Villa at Chiswick and its contents, with other heirlooms, came into the Cavendish family. In due course their third son, George Augustus Henry, who was invested with the revived title of Earl of Burlington, was succeeded by his grandson William, second Earl of Burlington (of the revival) and seventh Duke of Devonshire, who died this year, being succeeded by his son, the present Duke, who sat in the House of Commons as Member for Rossendale.

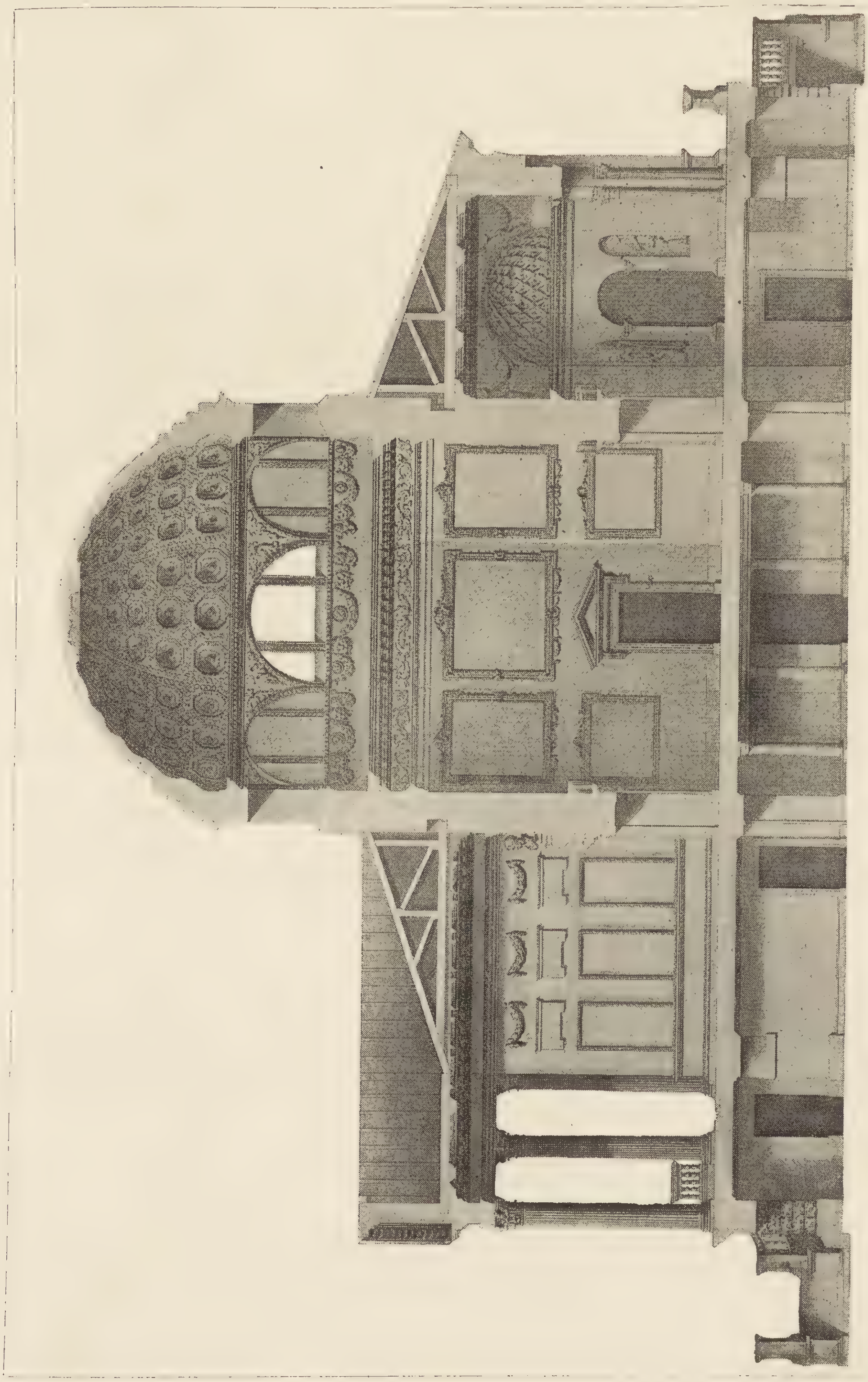


FIG. 118.—SECTION THROUGH A B C ON PLAN [fig. 115], REDUCED FROM AN ORIGINAL DRAWING IN THE COLLECTION.

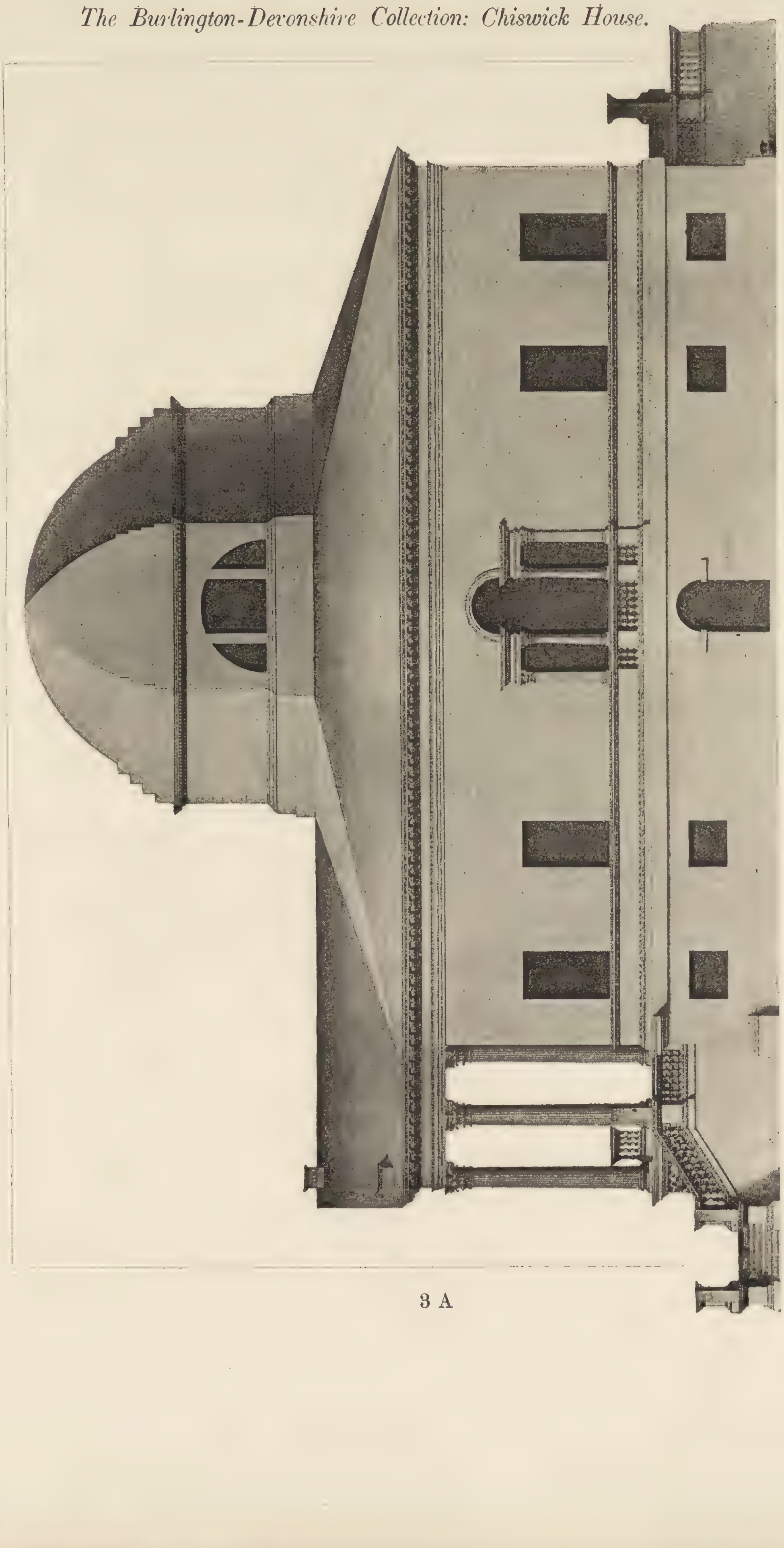


Fig. 119.—Side Elevation, reduced from an Original Drawing in the Collection. (As it was in the Earl of Burlington's time.)

can, however, be judged in the view of the interior of room E [fig. 122], which is from a photograph of the work as existing. It is worth noting, moreover, that the state entrance to the house, under the portico, is by a passage [A, fig. 115] leading direct to

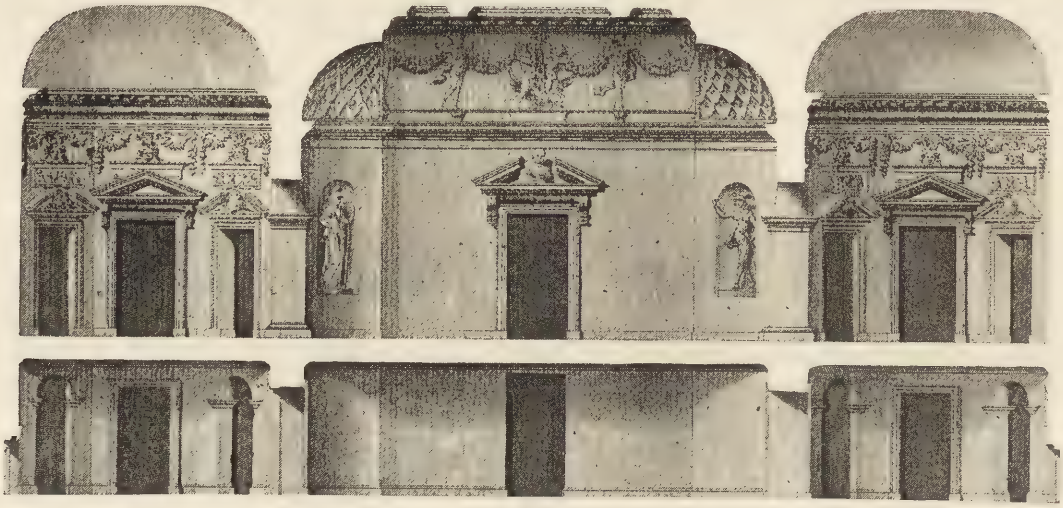


Fig. 120.—Section through E C D on Plan [fig. 115].
(Reduced from an original drawing in the Collection.)

the door of the central hall, no external door being shown in either the section or the plan; while, in conformity with early methods of distribution in residential edifices, the rooms give into one another, two at least of the corner rooms having originally

Fig. 121.—Section through F G D on Plan [fig. 115].
(Reduced from an original drawing in the Collection.)

served as bedrooms, and the room G, with the corresponding room on the opposite side of the central hall, B, or grand antechamber, having been drawing-rooms which connected the rooms at each extremity. In such a house, the attendants would have

Fig. 122.—Interior of Room E [fig. 115], containing the Palladian Portfolios.
(From a recent photograph.)

doubtless been stationed in the central hall, which would serve as the dining-room, and the bedroom service maintained by means of the four circular stairs. Although the room F, and the corresponding room on the opposite side of the entrance, A

Fig. 123.—An old Gate erected in Chiswick Gardens. (From a recent photograph.)

O Gate, how cam'st thou here?
I was brought from Chelsea last year,
Batter'd with wind and weather.
Inigo Jones put me together;
Sir Hans Sloane
Let me alone:
Burlington brought me hither.—Pope.

appear to be alone planned for the reception of bedsteads, it is highly probable that G may have been originally used also as a bedroom, and D as a dressing-room or, perhaps, a "*garde-robe*" and antechamber.

It is impossible to look carefully into the many English designs contained in this

Collection, especially those that may be ascribed to Kent, without a genuine feeling of admiration for the genius which produced them. Though to an eye accustomed to the

Fig. 124.—Reproduction of a Sketch in Brown Ink, in the Collection.
(Probably a portrait of Inigo Jones, drawn by himself.)

delicacy of French mouldings and ornament some of the details of the interior of Chiswick House may appear coarse, especially when the size of the various rooms is considered, they possess a finish and a general harmony of effect, rarely found in English houses

at the present day; artistic harmony has not characterised even the best work of the so-called Gothic Revival. Adorned as the rooms were with the most beautiful pictures, with ancestral family portraits, the panels of the ceilings exquisitely painted, the niches filled with appropriate busts—the ordinary furniture [fig. 122] being that of the time in which the house was built, and not an imitation of any foregone fashion to suit a "revived" style of architecture—the Villa at Chiswick must be regarded as a masterpiece, however small or however incommodious it may appear to a generation accustomed to refinements which have been developed during the hundred and sixty years elapsed since its erection. Whose was the controlling spirit that produced, or rather induced, the harmonious *ensemble* which until even recent years could be seen at Chiswick? Was it that of Kent? Was it not rather the Earl of Burlington himself? He had visited Italy and lived among Italian artists, and his education and proclivities were obviously of a character far removed from those of the men who are believed to have advised him in matters of design. It was he who, alone among them, had the means of tendering such advice. With the exception of copies of *Vitruvius* in the original Latin and in Italian, then rare in England, of Dr. Perrault's French translation of that work, and of *Les Edifices Antiques de Rome* by Desgodetz, there were few books from which to seek inspiration; and though, in 1665, Sir Christopher Wren wrote from Paris that he would bring back with him "all France "on paper, which I found by some or other ready designed to my hand," the available illustrations, even of foreign source, were very few. The assistance, therefore, of a cultivated enthusiast like Lord Burlington, armed as he was with original drawings by Palladio and his pupils, in the adaptation of an ancient or at least an earlier building to the wants and circumstances of the time, was invaluable from an architectonic view alone; and it may be confidently assumed that without it no such perfection as that still traceable at Chiswick could have been achieved. Pope's fourth Epistle does not read like a series of compliments; and the emphasis he lays on the mental quality in Architecture and the arts is too pronounced to be either artificial or an accident. His lines on the value of sense in Art, which, though so often quoted, bear constant repetition, may be appropriately compared with a delightful sentence by Isaac D'Israeli, in his "Characteristics of Bayle," that "*taste* when once obtained may "be said to be no acquiring faculty, and must remain stationary; but *knowledge* is of "perpetual growth, and has infinite demands." According to Pope,

> Something there is more needful than expense
> And something previous e'en to taste—'tis sense.

Lord Burlington's enthusiastic veneration for Inigo Jones was rewarded by Sir Hans Sloane's gift to him of one of Jones's Gateways, which he caused to be removed from Beaufort House, Chelsea, to Chiswick, where it may still be seen [fig. 123] —a fact commemorated by Pope in verse of less poetical smoothness than archæological interest. The cresting of the wall containing the gateway is a copy from some Italian example, a drawing of which is preserved in the Collection, the vase on either side

being an addition to the composition, and the stone tablet over each vase a modification of the original. That Lord Burlington recognised in Inigo Jones the pioneer of English Palladianism may be seen in the encouragement he gave to the publication of that architect's designs for the Palace of Whitehall with his own and Kent's; and in the Burlington-Devonshire Collection a numbered series of drawings of buildings erected under the charge of Kent and others—many of them bearing on the published plates the words "Burlington architectus" — is headed, as No. 1, with a brown ink sketch of Inigo Jones, or at least of some one bearing a strong resemblance to him. A facsimile of the sketch, except in the matter of colour, is given on a preceding page [fig. 124].

Fig. 125.—The Frontispiece of Lord Burlington's Book.

(Reduced from an original drawing in the Collection.)

Among the drawings is one for the frontispiece of Lord Burlington's book, the title of which [see p. 350 *ante*, footnote] is inscribed, in the plate, on the base of the design, with the further inscription, "Londra "MDCCXXX" on its plinth. The plate is also inscribed "A. P. inv." and "W. K. del." A reduction of the drawing is here given [fig. 125]. Cameron's book, *Baths of the Romans*, 1772 and 1775, contains a frontispiece of precisely similar design, but the base of the composition is wider, and it bears two tablets or plaques, on which, on the left-hand side of the plate, the title of the work is given in English, and on the right in French. In

Cameron's frontispiece * the bust, which is taken from a painting in the Villa Capra, is turned in a direction exactly opposed to that of the bust in Kent's drawing [fig. 125], which portrays a head of Palladio similar to one in the collection of the Institute.

Perhaps it is not unnatural for an Englishman, after a careful examination of all the drawings which compose the Collection so long preserved at Chiswick, to find himself insensibly attracted to the handiwork rather of Inigo Jones and Webb, of Kent and his assistants, than to that of Palladio. Manners are so changed since great noblemen kept a poet, or housed an architect, or subsidised a pamphleteer, that the interest attaching to their memory has something of curiosity in it. It is, moreover, a fair subject of inquiry whether the quality of Art was worse when a few highly-placed individuals made "falling arts" their care, as in Lord Burlington's days, than it is now, when professional artists resent almost as an intrusion any attempt of outsiders —or, in other words, those who do not make a living by art,—to do artistic work for themselves, without the so-called expert aid; and yet at the same time complain that even the educated public in this country are unable, from want of artistic knowledge, to appreciate "good art,"—that is to say, the work of artists by profession,—when they see it. This, of course, is an amusing contradiction; and there is another, still more ludicrous, peculiar to the waning years of the current century. So great is the veneration now felt for the memory of Inigo Jones and Kent, that it is forbidden to alter or adapt, convert to practical purposes, or even use their unappropriated or discarded works. Sir William Chambers said that behind an old wall in Piccadilly there was, notwithstanding its faults, one of the finest pieces of architecture in Europe; and therefore the famous wall, and more famous colonnade it hid from the outside world, were conveyed, at considerable public expense and with an æsthetic flourish of trumpets, to Battersea,—and there left in fragments on the river bank,—to make way for the Royal Academy of Arts of London! Again, a certain Water-Gate, drawings of which, bearing the name of Inigo Jones, were religiously collected by the Earl of Burlington, stands in a hole of the Victoria Embankment Garden, shunned like a ship in quarantine, or a newly excavated monument covering the remains of plague-stricken dead. None, not even Governments, dare make use of these remnants of the English Renaissance; but they are conscientiously left to rapid and effectual destruction by the hand of Time. The wiser Vandals of earlier epochs spent their heritage of stone and marble with more sense, and a better appreciation of public wants, than do the English of the present time; and happily so. Without the aid of the honest iconoclast, who never pretended to be anything else than what he was, there would have been probably no basilica like that of St. Sophia at Constantinople; and, in Western Europe, no cathedrals and churches such as those from which the two last generations of Englishmen have mainly acquired their knowledge of Architecture and the arts.

William H. White.

* See *The Baths of the Romans explained and illustrated with the Restorations of Palladio, &c.* Fo. Lond. 1775. [In the Library.]

C.

IMPRESSIONS OF A PUGIN STUDENT DURING HIS TOUR.

By JOHN BEGG, *Associate, Pugin Student* 1890.

[*Addressed to the Council.*]

MR. PRESIDENT AND GENTLEMEN,—

ELY CATHEDRAL presents to the sketcher an *embarras des richesses*; and with the discouraging sensation of having only a portfolio of blank paper (for nothing so stimulates to work as work done), and my hand cramped by a winter with T- and set-squares, I felt much at a loss where to begin. This soon wears off, and when I had felt my way with a little sketch in the choir, I was ready to begin something big: so tackled a bay of the wall-arcading in the Lady-Chapel, with its beautiful Decorated detail. The vaulting of the roof of the Lady-Chapel is here particularly beautiful; and the effect of spaciousness and light combining suitably for its purpose as a place to accommodate a large congregation, with great beauty of detail, renders this chapel a peculiarly valuable example for the study of modern church building, or rather more particularly *chapel* building. Ely is eminently a congregational cathedral, as witness also the Octagon. Alan de Walsingham, who built both, was evidently a believer in the pulpit. The Octagon is much spoiled by the ghastly green and red decoration of the vaulting ribs, but is a very noble bit of architecture. Note the details of the lower arches and piers, and the splendid canopies over them. One of the best features of Ely is the Galilee porch at the west end, of the west door of which I made a perspective from a position in front of the Bishop's palace. The effect got by the delicate tracery in the door-head, crisply relieved against the dark shade behind, is very pleasing. Another gem is Prior Crauden's Chapel, south of the Cathedral. This is a perfect example of a perfect period, and would bear thorough measuring. I did little more than make a rough sketch. I noted the peculiar tracery of the east window, also the exceedingly quaint little windows north and south, said to have been intended to throw light on the Prior's book. The larger side windows are very beautiful. Before leaving Ely Cathedral the south door to the nave should be

seen, with its richly sculptured tympanum. The Cathedral Close is full of quaint bits—the Deanery, the Canons' house, the massive Gatehouse at the south-east corner of the precincts, and the quaint "Gables Porch" [fig. 126] north of the Cathedral, facing the street. The great Gatehouse is particularly fine. The extreme simplicity of its design and its grand proportions give it an air of strength and dignity worthy of the principal entrance to a great monastery.

Fig. 126.—Ely: the "Gables Porch."

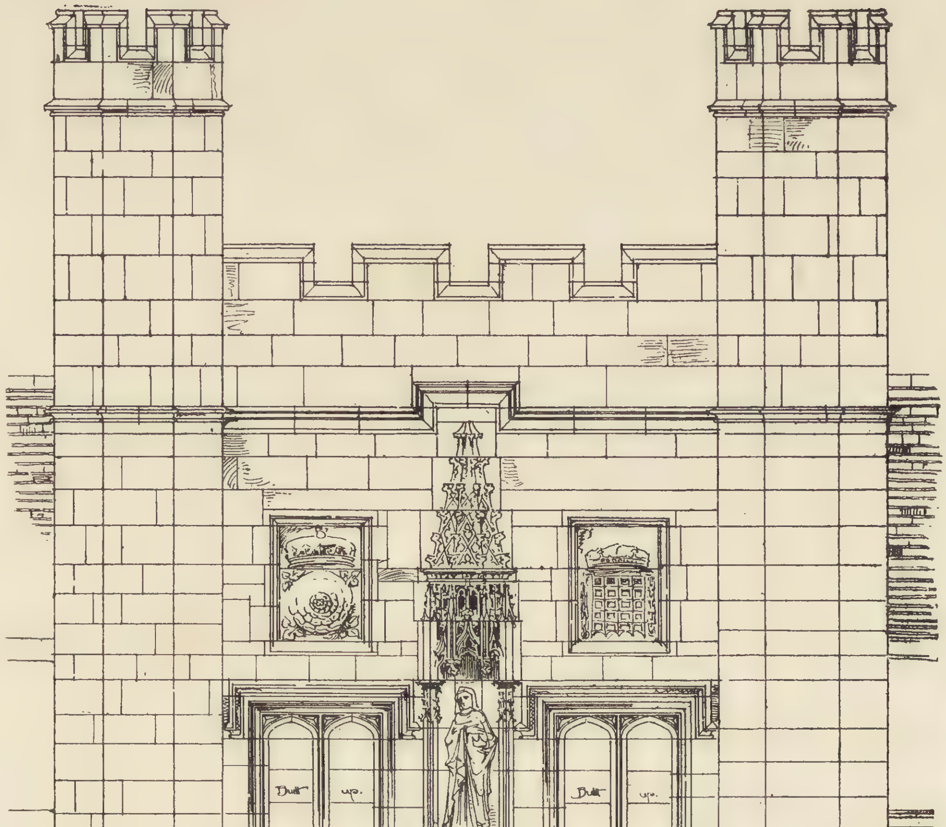
One of my first acts at Cambridge was to buy Professor Humphrey's *Guide*, an excellent one for architects as well as tourists. My first day in Cambridge was Sunday, the best day of the week for the sketcher to choose as his first day at any new place. Then he can wander about and make the place's acquaintance thoroughly, without being haunted—as every conscientious holder of a Studentship of course is when not turning out drawings by the ream—by the idea that he is wasting his time. Sunday at Cambridge, with such an ideal loafing ground as the Backs, and such an ideal place

of worship as King's College Chapel, is a day of a thousand. On Monday I undertook a systematic round of the sights, taking them in somewhat of the following order. At Peterhouse the chief interest is in the modern work. The Hall is a very fine restoration by Mr. G. Gilbert Scott, Jun., and the Combination Room, by the same architect, is also a gem. The fireplace at the west end of the room is old, and well worth study. Peterhouse possesses a very quaint Gothico-Italian chapel, built in 1628, which contains woodwork of good detail. At Pembroke College there is not much left for the study of Gothic, but the gateway on the principal façade is good; observe how simply a quaint effect is gained, and the gateway accentuated by grouping two oriels over it [fig. 127]. See Wren's Chapel, and the Library on the left of the entrance; the outer door of this is very striking. I pass over Corpus Christi College, where the kitchen is fine; St. Mary-the-Less Church, where the window tracery is the only point of interest; Queen's College, with its quaint courts, at none of which I did any work; and come to King's College, with its glorious chapel. Here a whole studentship might be spent, and that profitably. I did little more than make some careful studies of glass. I chose the windows in one of the chapels on the south side of the ante-chapel, and made drawings of the three best of them. The window with the figure of David playing a harp seemed to me particularly fine. The glass here did not originally belong to the windows where it now is, but has evidently been adapted from some large windows, for many of the figures fit their spaces but clumsily. However, all are very good, down to the diamond quarry glazing of which the backgrounds are composed. The flower patterns on each of these quarries are very delicate, and the windows are so transparent and *glassy* that they well repay study. The splendid windows of the chapel proper I did not attempt, nor the brass

FIG. 127.—CAMBRIDGE: PEMBROKE COLLEGE GATEWAY.

lectern, nor any of the stonework; and, of course, being Pugin Student, I strove not to admire the stallwork and the organ screen, unsurpassed, I am told, by anything in Italy itself. In the presence of such majesty as that of the interior of King's College Chapel, one can but admire, and the most irrepressible sketcher must feel loth to do aught else. My attention was next devoted to Christ College, founded 1505. Here I made a scale-drawing of the gateway [fig. 128]; a very good typical example of a Cambridge gateway. The Hall of Christ's has been splendidly restored by Mr. G. G. Scott, and contains some wonderful wood detail by him, notably the gallery front. A small door (old), of which I have a drawing, opening from the Masters' Lodge to the daïs of the Hall, has very delicate detail. The spandrels have the Tudor emblems of the rose and portcullis charmingly worked in. The gateway of Jesus' (A.D. 1495) is unique, and I regret not having been able to fulfil my intention of making a scale-drawing of it. It partakes somewhat of the character of an Oxford gateway, but the material—stone and red brick, with a diagonal pattern of yellow brick—and the detail both smack of Cambridge, while the high-stepped parapet gives it a character of its own. There is a fine doorway, which I measured, to the right in the first court. The mouldings are subtile, and the way in which the label comes down on the flanking quadrilateral shafts is "tricky." The crockets and finial on the label are bold and well carved. One is struck with the peculiar cusped panels in the spandrels, the punning crest of the founder—Bishop Alcock—and the good effect of colour and gilding on this and the coats-of-arms in the spandrels.

In the Chapel are some oak bench ends (old), and (modern) good "Burne-Jones" glass, and a magnificent organ-case by Mr. G. F. Bodley, A.R.A., whose fearlessness in the use of bright colour and gold is here only matched by his taste, and the successful effect of it. Coming back from Jesus' towards the river, past the Church of the Holy Sepulchre, we reach St. John's College, some of the original drawings of which are preserved in the Library, and are very curious and interesting, showing that, on paper at least, we have learned to do better things. They are drawn with but little regard to scale—as far as the elevations are concerned apparently with none. St. John's Gateway is a very noble conception, strongly reminiscent of Christ's, but far grander. In my drawing I have tried to suggest the rich colour of this building, the deep red of the brick, and the weather-stained stonework. The great coat-of-arms—that peculiarly *Cambridge* feature—is a perfect study in itself, and the naïve way in which its author bestrews the whole with daisies in wreaths and clusters is very charming. He has evidently firmly believed in contrast, placing always a field of daisies in the shadow of his bold, strong details—his crowns—his portcullis—his great Cambridge roses—his heavy stringcourse. The proportions of this gateway, not only in itself, with its lofty, boldly-projecting angle towers, and the deep shadow of its archway, but also in relation to the college buildings, make it an object likely to attract the attention of the most callous; yet how often does the sketcher notice that his presence in front of this (as of other buildings in towns) seems to awaken the passing natives to a sense of its beauty, and how strange it is



Drawn to a scale of about 18 inches to one foot.

Fig. 128.—Cambridge: Christ College Gateway.

to observe how they regard with attention—it would seem for the first time—what they have passed unheeding every day in their lives! In the first court, facing you as you enter, is a doorway of good detail, and the seventeenth-century buildings next the river are as fine as anything in Cambridge. I could not resist measuring the Library door, a choice bit of Elizabethan detail, though, perhaps, this is just on the verge of being beyond what a Pugin Student must study. This door has the great defect that the tympanum forms part of the door proper, and it gives one a severe shock to see, when it is opened, the coat-of-arms moving away and leaving the gilded mitre sticking forlorn to the archivolt.

I had now been nearly a fortnight in Cambridge, and though I seemed barely to have dipped into the stores of good work to be found there, still I knew I ought to move on. Trinity College, one of the very finest, I had to leave untouched. The Church of St. Mary-the-Great and the other churches I merely looked at; and, of course, all the Renaissance works, as at Clare, Inigo Jones's buildings at Christ's, &c. &c., were quite beyond my sphere.

Fig. 129.—Oxford: Boss to Label of Chapel Door at Magdalen College.

I moved on to Oxford on 9th July (1890), and here again much time was spent at first in sight-seeing. Fortunately the weather was fairly good, a pleasant relief after that experienced at Cambridge, where it had been very wet. Oxford, as a University, is more imposing than Cambridge, and one is surprised to hear that it has fewer undergraduates. It is not so pleasant a place for the sketcher, being more of a town; while tourists—comparatively rare at Cambridge—frequent Oxford. There is so much in the latter city which must be seen, that I shall be unable to undertake a systematic description of everything of interest, but must devote my attention chiefly to an account of those places at which time allowed me to make any drawings. At Magdalen College I spent most of my time. The detail here is very rich, the west door of the chapel, of which I made a scale-drawing, showing some exquisite touches. This door, and the gateway in the Founder's tower, possess a unique feature in the flying-arch, which springs out from among the jamb-moulds, and joins them again in the centre of the lintel. Note also (in the chapel door) the delightful lily ornament in the cavity of the label moulding; and particularly the bosses of this label, sculptured in the form of angels, with their wings clothing the moulding above. The angel on the right side of the door is far the more beautiful—indeed, so delicate a bit of Gothic sculpture is not often met with [fig. 129]. The spandrels of the chapel door to the north are good, but here the straight lines of the upper part of the arch are rather degenerate. The Founder's tower is a beautiful design, and groups splendidly with the adjoining buildings. In

the archway of this tower is a fine bit of late vaulting, with carved bosses and very fine corbels. I did not attempt to draw the great Magdalen tower, much though I should have liked to do so; time forbade it. While at Magdalen I sketched one or two picturesque items—the oft-sketched corner pulpit in the first Quadrangle, and the equally favourite Grammar School. Fine though the great Quadrangle at Christ Church is, one regrets its unfinished state, and especially the gorgeous chapel which Wolsey intended to build on the north side, and which would have eclipsed King's College Chapel at Cambridge itself. The staircase to the Hall in the south-east corner is fine, and the tower above has been splendidly restored by Mr. G. F. Bodley, A.R.A. There is a delicate bit of Decorated detail in a piscina in the south choir aisle; but, unfortunately, this has suffered, as usual, by having had the bowl hacked off [fig. 130]. Some of the old glass in the north aisle is good, and there is much good modern glass by Mr. Burne-Jones, A.R.A., throughout the Cathedral. There is an exceedingly interesting "watch-"ing loft" in the north aisle of the choir, the lower part of stone and the upper of oak. The Cathedral is a perfect storehouse of treasures—old stalls, brasses, glass, monuments, not forgetting the fine Wren organ-case.

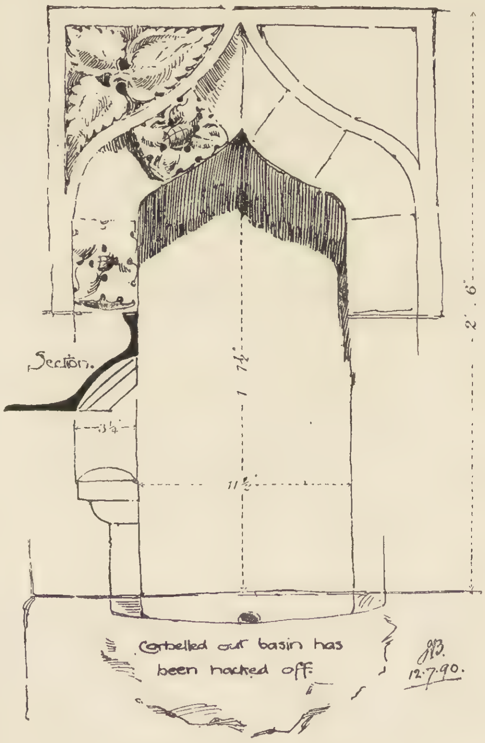


Fig. 130.—Oxford: Piscina at Christ Church.

All Souls' College (A.D. 1437) is most interesting; the details of the Quadrangle and about the gateway being very good. The gate tower may be quoted as that best *typical* of the Oxford [fig. 131], as distinguished from the Cambridge type—square, with only the one staircase turret at an angle. In the chapel is some good glass, and there is a fine Elizabethan lecture-room on the east of the Quadrangle. The windows are lead-glazed, the wall high-panelled, and the plaster ceiling is arched, and marked out in a pattern by ribs, the ornament being touched up here and there with colour. This room was formerly the Library. New College is a glorious place, with its grand chapel, its cloisters, and the fine hall. The Chapel has a very dignified exterior, the proportion of the buttresses and windows is good; but it is inside that the chief glories lie. Here is such glass as I have never seen. I do not mean the Reynolds window—fine as a painting, but not decorative, not glass—but the smaller windows north and south of the ante-chapel. Such colour, such a decorative treatment, such silvery lights, and such transparency! On the floor are some fine brasses,

Fig. 131.—Oxford: All Souls' College Gateway, from the Quadrangle.

and the oak stalls in the chapel proper are good, though the old parts remaining have had to be much supplemented in restoration. At one side of the cloister is an old

belfry, which originally stood on the city wall. There are some quaint corners about the first Quadrangle. The Gate tower is good, but, of course, is ruined and swamped by the raising of one storey over the rest of the Quadrangle. The tower over the stair to the Hall is also good. In the Hall itself is some excellent woodwork, with a very elaborate type of the linen-fold panel. Two doorways in the inner court, and the wrought-iron gates to the gardens, are worth a visit. The Church of St. Peter-in-the-East has a fine Early Perpendicular porch, with chamber over. The details are good; note the ground-floor window with square traceried heads. At Merton College I did little work. The old Library is very interesting, and so is the Chapel, but my visit to the college was too hurried to allow of my bringing away any notes. Much careful drawing might be done in the Library.

The buildings looking over Merton Fields are fine, quiet, refined, and collegiate. The Church of St. Mary-the-Virgin is well worthy of being carefully studied. I had expected great things of the tower, but was grievously disappointed when I saw it. The details seem heavy, and the spire overloaded with inane richness, while there is something very raw about the belfry windows. The church itself is very fine, and I resolved to measure a bay of it, but found it impossible to negotiate with the vicar, who regarded me as a highly suspicious character—indeed, from him I experienced the only incivility which I received during my tour. Even the imposing official recommendation of the Institute had no softening influence on him: he refused to read it. He did not care a dash (coming as near as clergymen can to expressing themselves as excited laymen might) for the Institute! He was Vicar of St. Mary's! Having suffered the further mortification of finding him gone before surprise allowed me to reply as my feelings prompted—for he took the advantage of slipping away where I could not follow, thinking, perchance (to be charitable), that he had gone too far—having also wasted a whole forenoon over futile negotiations—I sought to forget the vexation, and my spleen against mankind in general (and clergymen in particular), by spending the rest of the day on the river. To conclude, both here and at Cambridge I experienced an awkward feeling of restraint in that my condition as Pugin Student compelled me to devote my attention to Gothic, while in both places there is such abundance of exquisite Renaissance work, not to mention the best of modern work that the country can show. And if in my notes a little bit of detail from a period beyond my sphere should here and there be found, I must crave the pardon of the Institute on the grounds that I certainly spent more than eight weeks on Gothic pure and simple. And now, for the rest of my tour, I devoted myself to Church work, and that almost entirely.

From Oxford to the City of Shoemakers is as great a change as could well be. From sleek dons and easy tourists, to sallow, careworn workers in leather; from gowns to leather aprons; from the fragrance of lime trees and the music of sweet bells, to the dull rap of hammers and the odour of boots and shoes! However, pleasant as was the dreamy atmosphere of Oxford, in Northampton I found more incentive to activity, perhaps because I was in the atmosphere of manual work.

How much this feeling was due to the fact that I was now alone and left to my solitary devices I cannot determine, but the fact remains, that I now worked much harder and covered more paper than formerly. Arriving on the evening of 25th July, I at once found a lodging hard by St. Sepulchre's Church, where I made a start next morning with a sketch of the south side. This Church of the Holy Sepulchre is more picturesque, and interesting archæologically, than valuable to the student. The Norman round church has been surrounded by a lower porch and nave, and the effect outside and in is picturesque in the extreme. The details of some of the Early English work are good, especially in the arcade in the north aisle of the nave. The use of two colours of stone—grey and white—has a good effect; but Sir Gilbert Scott seems to have somewhat overdone this in his modern restoration. I had made up my mind that the best thing in the neighbourhood of Northampton would prove to be Whiston Church, my desire to see which had been whetted by finding it described in a friend's notes as "the finest and most complete Perpendicular church in existence." Therefore, as soon as possible, I took train one morning to Castle Ashby station, and after a walk of a mile and a half found myself in a most picturesque spot. Whiston is a village, of the minimum dimensions worthy of such a title, consisting of a farmhouse, some cottages, the rectory, and the church [fig. 132]. This stands on a hillock clothed with high trees, and as you come up the steep path and into full view of the beautiful tower, it presents a vision of loveliness—delicate, strong, quiet, yet striking—which the pinnacles, peeping hitherto over the trees, had but little suggested. Being so much prepared for this church, I was prepared to be disappointed, but found it quite to justify my friend's recommendation. The first thing that strikes one is the colour of the tower, which is built of grey-stone, with masses of yellowish ironstone here and there introduced. I have endeavoured to suggest the colour in my drawing. Then the proportions and details of the tower catch the eye; the extremely subtile way in which the corner buttresses are diminished. Plain and massive, with good projection at the lower stages, they develop into the richest clusters of pinnacles at the top; and so naturally, that the eye meets with no obstruction as it is carried upwards, and arrives at the top with a feeling of entire satisfaction. The eye has a good time of it at Whiston: as it roams from the rich parapet to the delicate belfry windows, down to the west door, with a long glance for the window over it; as it discovers one by one the quaint, vigorous sculptures that bristle on strings and cornice; then as it wanders from the lovely tower to the church itself, it finds a continual feast spread for its refection—the tracery on the windows, the porch [fig. 133], the north door. But the beauty of Whiston Church lies not merely in its details, which only confirm and justify the favourable impression made by the proportions, the harmony of parts, the simplicity. As yet, we have not ventured inside. We must first walk across the meadow to the pretty rectory opposite, where we shall be entrusted to the care of an obliging gardener, whose architectural creed begins and ends with the belief that "Whiston is a fine church." Inside, as out, it is a rare gem.

The nave of four bays is flanked by wide aisles, and prolonged to form a short

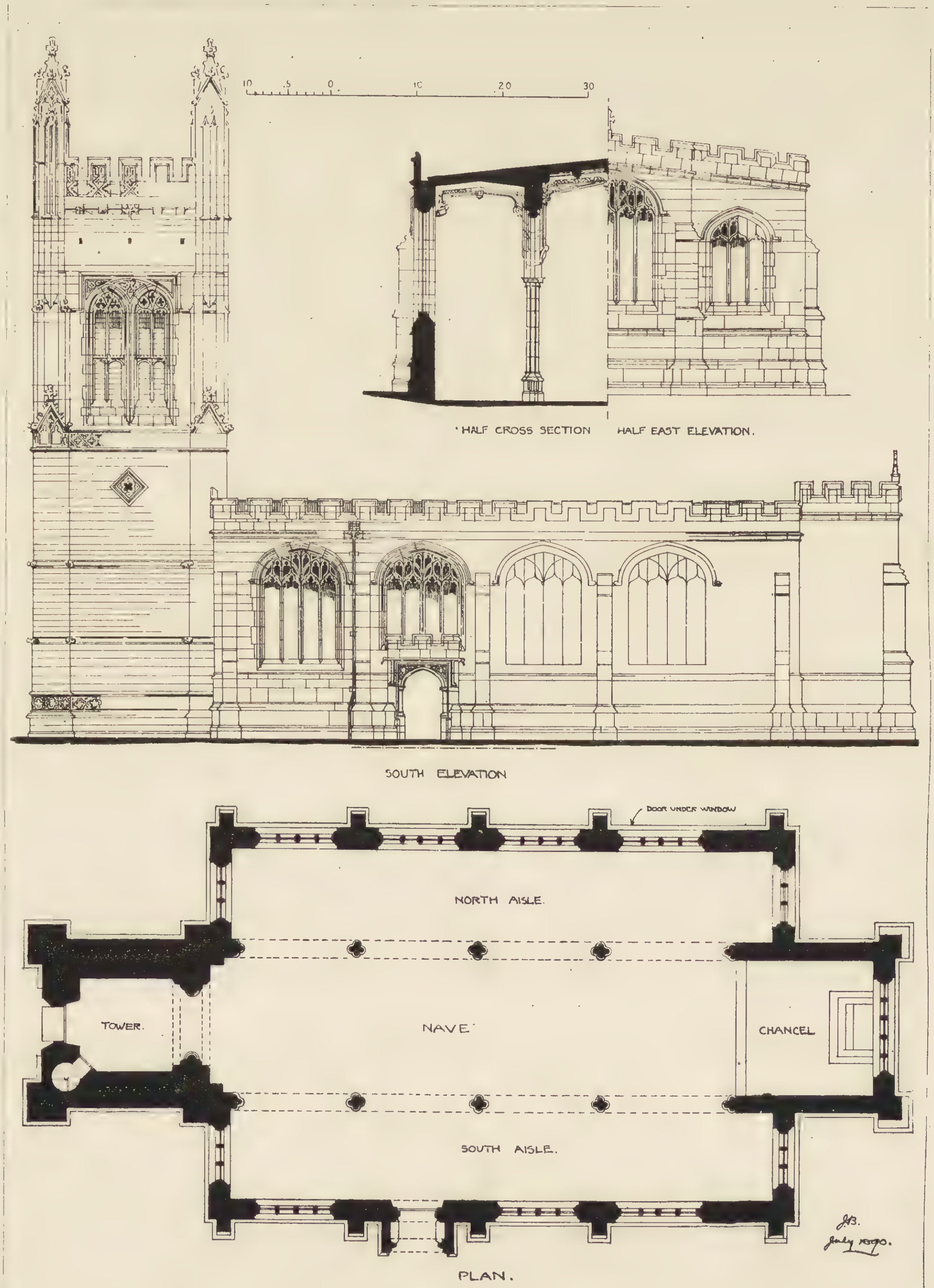


Fig. 132.—Whiston Church, Northants.

chancel, and the whole church is under one low-pitched, lead-covered roof. The detail of the nave pier and arch is fine, and the line of the arch very subtile. The spandrels are filled in with rich cusped tracery, and the roof is carried by shafts rising out of carved bosses, representing angels holding scrolls which formerly bore the legend, "Alleluia." A word as to the roof, which is of oak, with principals, purlins, rafters, and wall-plates richly carved, and the undersides of the roof-boards exposed. The principals are two to a bay of the church, and those that come over the centres of the arches are finished with carved bosses which have shields bearing, some, the emblems of the Passion, some the arms of the Catesbys, to which family belonged the Anthony Catesby, of Arthingworth, who founded the church in 1534. There is a good Perpendicular font with a quaint Jacobean cover, and the oak pewing, scanty, though adequate

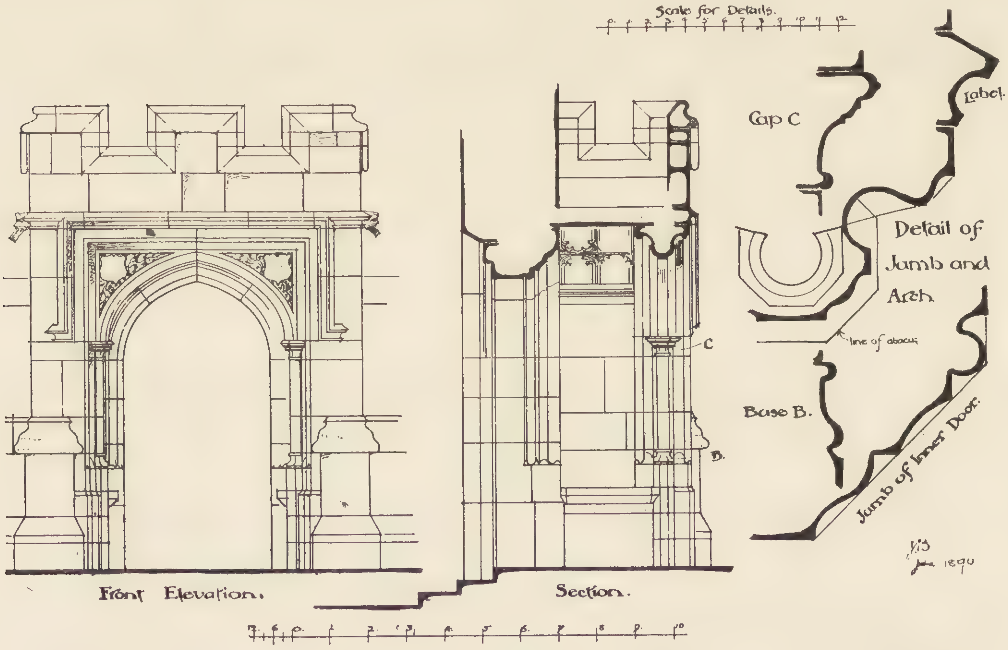


Fig. 133.—Whiston Church: the Porch.

for the requirements of the parish, is old and good. Where all is so perfect as at Whiston, one misses stained glass, but of this the church is quite devoid. One day I devoted to the church at Harlestone, four miles by road from Northampton. This is a plain church, but the nave arcade (Early English) is very good in proportion, and the aisle windows (Decorated) are also good, particularly those in the north aisle. The tower is quaint, and so is the south porch, but the details of the latter are rude. This church has the peculiarity of remaining open always, day and night; some departed benefactor having attached to his bequest a stipulation to the effect that it should do so. At St. Giles's Church, Northampton, there is not much of interest, except archæologically; but at St. Peter's is to be found some of the finest Norman work in the country. The mouldings—but more particularly the carving of the nave capitals—are

fine; and, with the comparatively slender proportions of the arcade, partake more of a French than of an English character. At St. Peter's is a Decorated font, with some good points of detail. Not far off, on the same side of the street, is a striking Jacobean house, said to have been once inhabited by Oliver Cromwell. It has a splendid front and well-designed dormer-windows, and the large-quarried lead glazing in the mullioned windows is very pleasing in effect. There is another Jacobean house (ruined by modern paint) at the corner of the Market-place in Newland.

Fig. 134.—Higham Ferrers: House with Chimney typical of the Locality.

Higham Ferrers is a quaint village of one street crossing a wide market-place. There are several old houses worth sketching—all of stone—splendidly solid, with the windows filled in with large quarried glazing, which has always such a good effect. Here also I first saw the typical chimney of the county, afterwards to become so familiar, of large slabs of stone with wind-breaks, and the whole covered by a moulded coping [fig. 134]. There is a splendid group of buildings in the churchyard—the church with its lofty spire, the old Perpendicular school, and the lovely Bede-house opposite, of the same date.

The church is an Early-English foundation, to which period the nave arcade belongs, with Decorated windows—north aisle, and Lady-Chapel, where the organ now is, added later. The Lady-Chapel, continuing the widened north aisle, gives the church a doubled appearance; and the east windows of the choir and Lady-Chapel are so similar that there seems from the outside to be two chancels. The church contains much fine woodwork, some fine brasses, of several of which I have rubbings, and a font, which I measured [fig. 135]. Of the woodwork, the stalls are especially noticeable, and the poppy-heads are unsurpassed. The screenwork is also plentiful and good. The spire was rebuilt early in the seventeenth century. In such a locality of fine spires it does not rank among the best. The Early-English west portal is one of the finest features about the church, and is rich in good carving and sculpture. The fifteenth-century Bede-house on the south side of the churchyard is built of banded grey and brown stone, with a steep roof. Observe the beautiful bell-cot over the west window, the fine tracery of all the windows, and the subtile detail of the north and west doors. The interior has a good oak roof, with curved principals. Unfortunately it is now no longer used as an

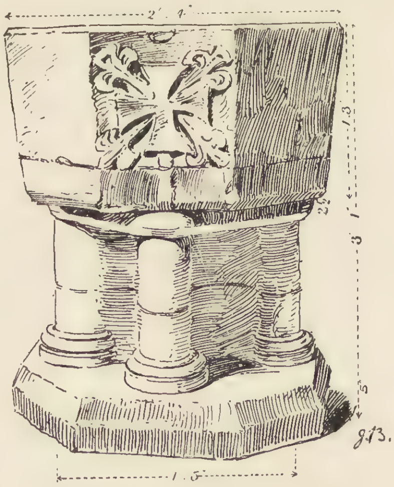


Fig. 135.—Higham Ferrers Church: the Font.

almshouse, and the picturesque institution has been supplanted by the practical modern method of giving aid to the bedesmen in their own homes. The school, founded by Archbishop Chicheley, is a Perpendicular building, with good windows, a rich parapet, and pinnacled buttresses. There is a fine Perpendicular gateway in the street which marks the position of another of Chicheley's buildings in the college which he founded here. A walk of about three miles takes one to Irthlingborough, where I expected to find the old tower with octagonal lantern, but only arrived to find myself too late by two years. It had become ruinous, and was pulled down, and the fragments litter the churchyard in mute appeal for funds with which to complete the re-erection, now standing about fifteen feet from the ground. The church is plain in detail, but is very pleasing internally, and the font is good. Failing to find much to occupy me at Irthlingborough, I walked on to Finedon, two miles further, along a dusty, shadeless road. The church is a grand one, very dignified in its proportions, and having a noteworthy feature in the great strainer arch across the nave, evidently introduced to correct a settlement of the walls. There is a fine Renaissance organ-case, not unlike that in Oxford Cathedral. The tower is refined and simple in treatment. The straight vertical lines of the buttresses at the belfry stage have a fine effect. One mile to the south of Higham Ferrers is the busy little town of Rushden, with its fine church. Here there is a glorious tower and spire, rich in colour, and having the same vertical treatment about the belfry stage noticed at Finedon. A notable feature is the rich traceried panel band between the buttresses, over the bell windows. A development of the same idea is seen at Finedon. The design of the spire crockets is peculiar, and hardly graceful. Altogether this spire is, I think, very superior to that at Higham Ferrers, more graceful in outline, and better in detail. The church internally has been much knocked about at different periods. Here, again, we find a strainer arch similar to that at Finedon, from which it is believed to have been copied, purely as an ornamental feature, and not from any structural necessity. There is some good oak screenwork, and a fine Early English font. The north porch with over-chamber is very good, and a typical example of the period. The tracery of its ground-floor window is remarkably good. I noted also the very ingenious way in which the apex of the groin ribs is treated to simplify the central intersection, an artifice which I have never met with elsewhere, and which is a pleasant variety from the conventional boss.

On 8th August I left the Nene valley behind me for a spell, and went to Kettering. Leaving the station, the magnificent spire of the church (A.D. 1260) bursts into view, and when you come opposite to it at the west gate of the churchyard it conveys an idea of enormous height. There is something very taking about this spire, which is of the sixteenth century. It has none of that haphazard appearance that so many of those of an earlier date show, and the details throughout are delicate (if a little effeminate) and appropriate. Its characteristic features, the battlemented corner pinnacles at the base of the spire, are very good, and with their stumpy outline form an admirable set-off to the tapering spire above. I found the church undergoing restoration; and not

being one of the general public excluded from the works, I was able to work unmolested by the idle and curious, who usually mark the sketcher as an object for their own particular entertainment. I made a measured drawing of the west door, and a sketch, from the east, of the spire. This sketch shows the unique east window, less beautiful than interesting, as marking the transition in tracery from Early English to Decorated. With the exception of a plain little almshouse, Kettering is singularly devoid of old houses, but in the neighbourhood some are very good. Notably at Weekley, two miles off, there is a very fine Jacobean almshouse with picturesque gables—Montagu's Hospital built in 1614*. Weekley Church is a very simple little place, with a nice Decorated tower and spire. Little more than a mile further on is the village of Geddington, where the Eleanor Cross is worth a visit. It is not so fine as that at Northampton, but is unique from its triangular plan, and the mass of diaper-work with which the lower part is covered. To the church I devoted myself particularly. I was struck with the Decorated tower and spire—plain, but well-proportioned. The east window is also rather fine.

One of my day tours from Kettering consisted of a walk to Burton Latimer, about four miles to the south-east, passing *en route* the church of Barton Seagrave. Here some fine Norman work remains, notably in the north door, where, in the tympanum, are rude sculptures treated in a very decorative way. There is fairly good Decorated detail in the wall arcades of the chancel and the north chapel, but all has been completely restored. Two prayer-desks contain good bits of Perpendicular woodwork. The church has a very peculiar plan. At Burton Latimer there is a fine Early English tower and spire. The former is low and squat, and the latter tall, and the effect, especially as seen from the south-east (the point of my sketch), where the corner staircase accentuates the squatness of the tower, is very charming. There is a fine Decorated north porch of tall proportion, but without a parvise chamber. Internally some good Early English foliage is to be found in the nave caps, and there is an old Decorated rood-screen, but it has been horribly ornamented in colour and gold. A large quantity of interesting fresco-work remains on the spandrels of the nave arcade and in the north aisle. In the village I noticed a good Jacobean school. About five miles to the north-west of Kettering is the quaint little town of Rothwell, which, in itself, contains quite a wealth of good work. In the town is the unfinished market hall, begun by Sir Thomas Tresham in 1577; Jesus Hospital, a fine old Jacobean almshouse; and the exquisite manor-house at the west gate of the churchyard. The church is very interesting, though in a sadly dilapidated condition. Every period of Gothic is here represented, but, as is usually the case, the "Third Pointed" work is by far the best. See the fine east window of which I made sketches [figs. 136*a*, 136*a*], and which harmonises so wonderfully well with the early work in which it has been set. The plan of the corner pinnacles of the east end is peculiar, from the way in which they are set with relation to the octagon below. Inside, in the chancel, is one of the finest brasses I have ever seen,

* See, in Transactions, Vol. VI. N.S., an illustration of the Entrance to Weekley Hospital (LXVIII., xxix).

and of which I made a rubbing. It was made for William de Rothwelle, Archdeacon of

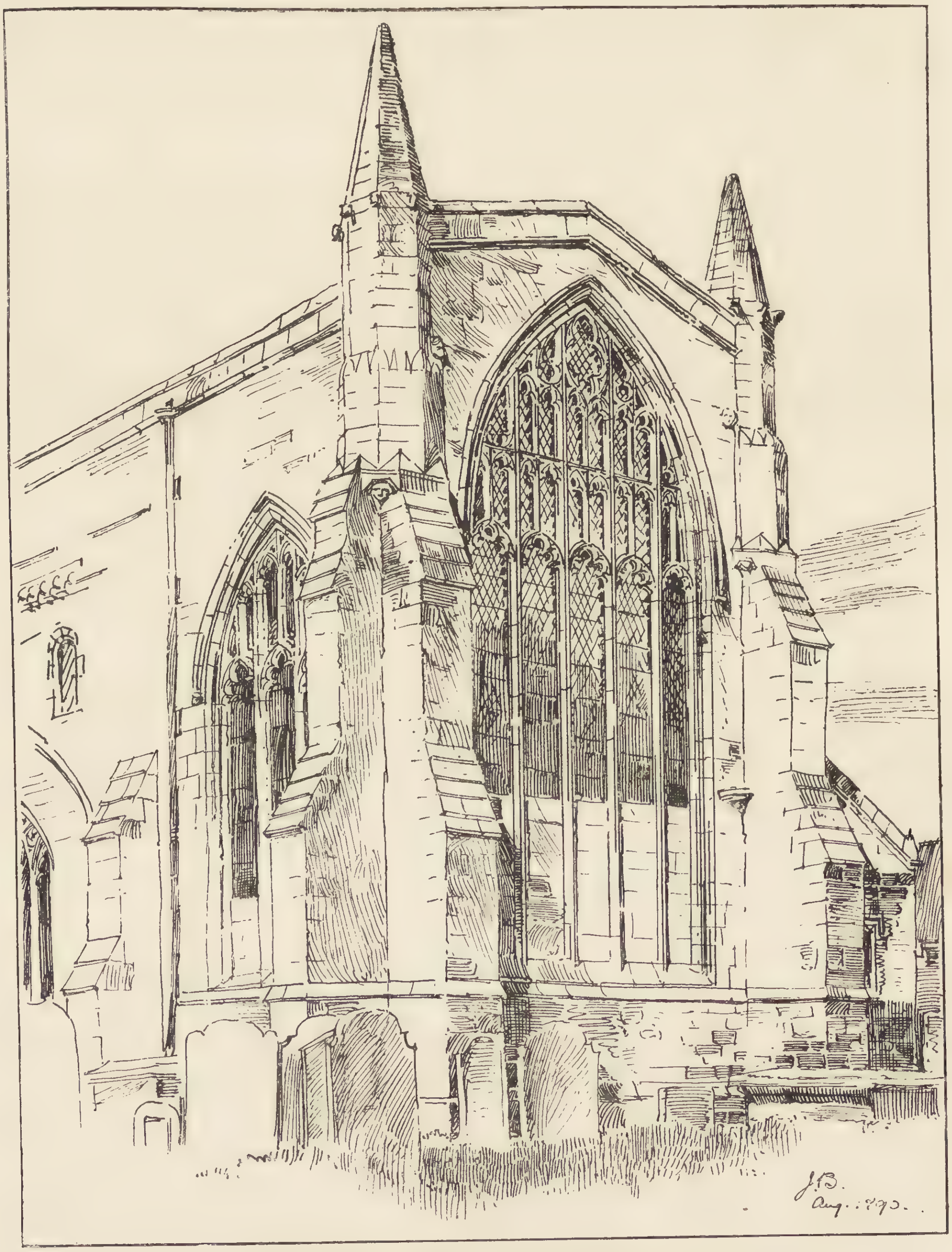


Fig. 136.—Rothwell, Northants: East End of the Church.

Essex, and belongs to the latter half of the fourteenth century. The treatment is thoroughly decorative. There is great feeling and subtilty in the lines, but the chief

beauty lies in the way in which the head, resting on a pillow, is supported by an angel on either side. The drawing of these angels, their wings, the flowing lines of their robes, and the slight variety there is between them, are features that mark the touch of a true artist, and give a charm to this brass which is possessed by none other amongst those I encountered on my tour. The arcade of the chancel aisle is Early English, and the north-west and south doors show interesting transitional Norman detail. In the nave is a splendid eighteenth-century brass candelabrum.

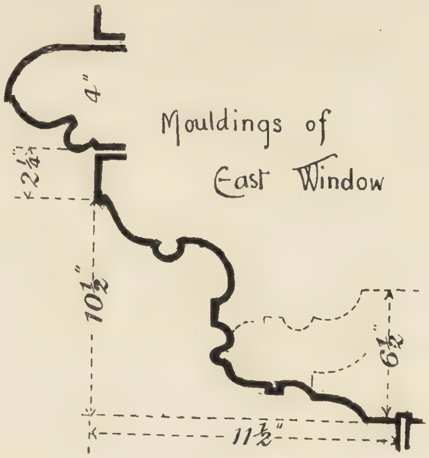


Fig. 136*a*. - Rothwell Church, Northants.

I moved to Thrapston on 14th August, and put up at the "White Hart," a very comfortable old-fashioned inn. Thrapston is the centre for a great number of good churches, though its own church is not of any importance. At Raunds, the chief interest is centred on the tower and spire, built early in the thirteenth century, and as fine as the period can boast. But, though grand in scale and of a noble presence, partly from its splendid situation, the architect is apt to find the broach treatment a most unsuitable one for a

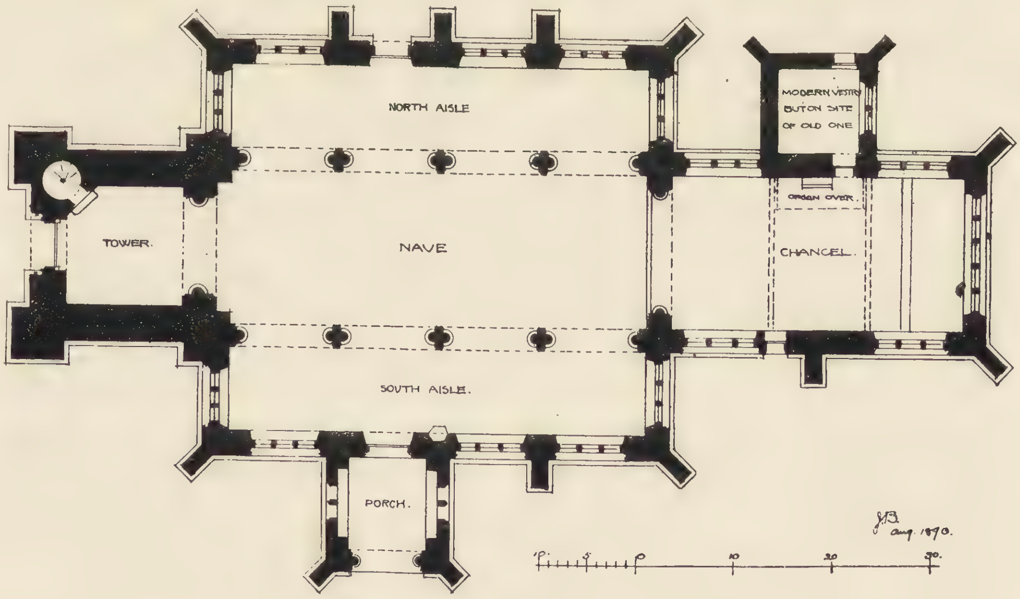


Fig. 137.—Islip, Northants: St. Nicholas' Church.

spire of such dimensions, and I was much disappointed with it, as, indeed, I was with nearly all the Early English work in which Northamptonshire is supposed to abound and excel. Raunds Church itself is of fine proportions, and contains some fresco

work on the nave walls. From Raunds I walked to Ringstead, where the church is chiefly to be recommended on account of its splendid Late Decorated tracery, and thence returned to Thrapston by Denford, a quaint little church. Here I was much struck by the charming little Perpendicular clerestory windows with square traceried heads. I observed the way in which the label is worked in with the parapet above. One of the best churches that I visited was at Islip [figs. 137,138]. There is an impression of completeness about this church that is very delightful. The broad short nave and aisle seem just of the right size for the chancel; and this, long in proportion to its width, is one of the prettiest little chancels I have ever seen. Then the spire seems just of the proper height for the tower; and the tower and spire, again, are not one foot too large or too small for the church—in short, a more completely successful effort in proportion, and in *scale* also, than this church it would be hard to find. Then the details are not only perfect in scale, but are themselves extremely beautiful, with mouldings of the subtilest,

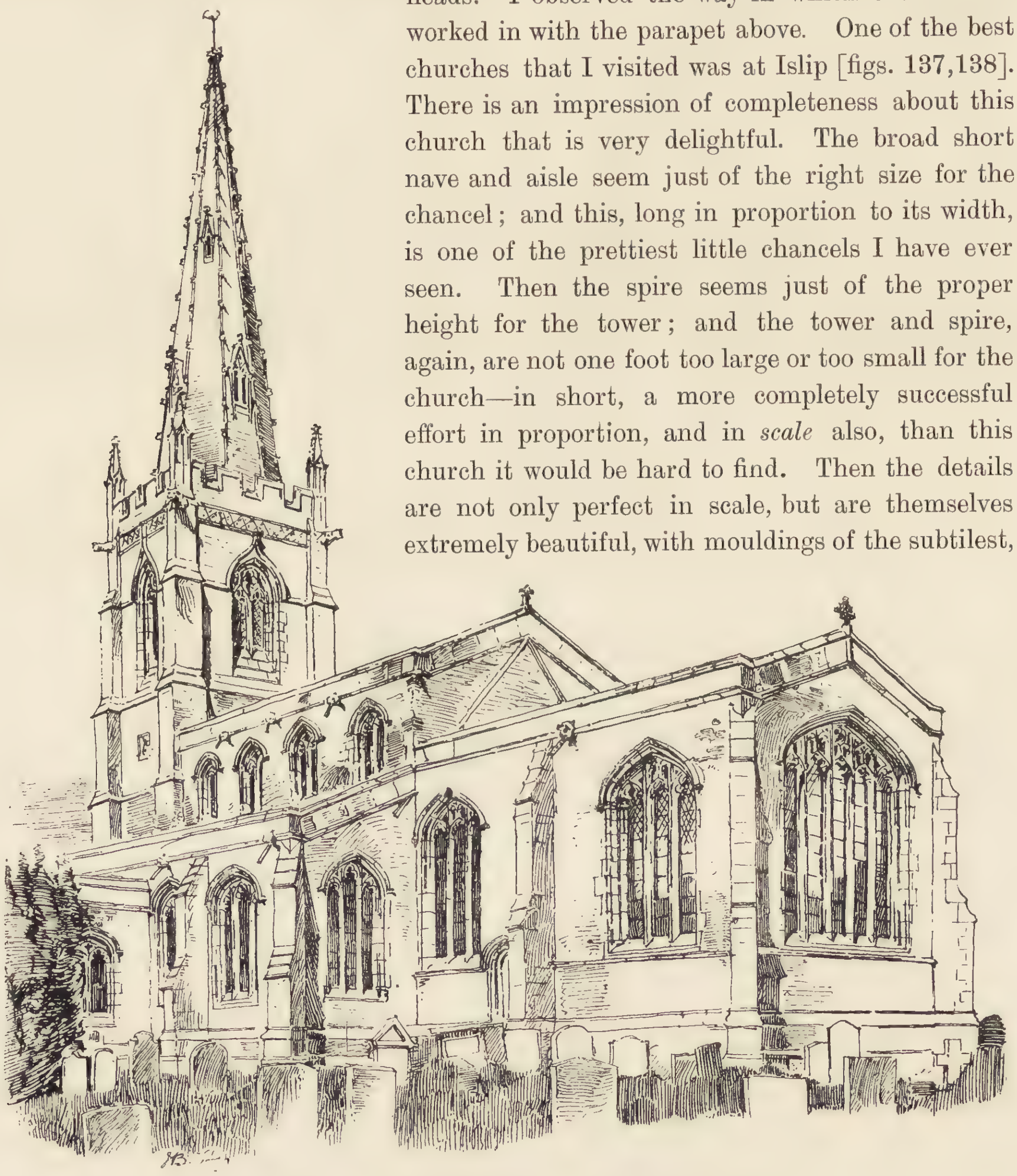


Fig. 138.—Islip, Northants: St. Nicholas' Church.

the most refined. What a gem is the porch (I would take exception to the size of the caps in the doorway, though)! How charming the little niche over the arch, and the way in which the canopy is made to support the shaft which crosses the parapet and terminates in the gable cross! How simple and good are the aisle windows, the

aisle buttresses, and those of the chancel! The east end of this chancel is a gem, with its broad proportions and fine angle buttresses, and the splendid east windows. Not less to be admired are the clerestory windows; but for the tower and spire "admire" is too feeble an expression. Coming to this spire from Raunds, one realises how enormously the later Gothic architects had advanced their art, if in this one direction alone. Inside the church one is struck with the peculiar plan of the nave piers, and the subtile way in which this blends with the section of the arch, after passing the capitals. The roof of the chancel, of oak, with heavy carved principals, is very fine. It is impossible here to enumerate the good points of this church. In the three or four days I spent at it, I found it impossible to draw them all. Another fine church, a mile and a half further on than Islip, is that of Lowick, with a very grand tower, seen above the trees for miles. This rises to a good height, and is surmounted by an octagonal lantern, having eight corner pinnacles. These, with the four pinnacles of the tower and the apex of the roof, have each an iron vane finial—thirteen vanes bristling against the sky—a very quaint effect. My scale-drawing gives some idea of the appearance of this tower, and the good Perpendicular detail of which it is full. I observed the peculiar club-foot idea at the base. Inside are some fine monuments, particularly that of alabaster to Ralph Greene, Esq., and his wife—date about 1420. The angels round the pedestal are quaint, and have more the appearance of Chinamen than ordinary celestial beings. The glass in the north aisle windows is good Decorated.

The afternoon before I left Thrapston I took a walk to Tichmarsh, and thence round by the Aldwinkles. Tichmarsh Church is large, and chiefly of Late Perpendicular. There is a fine tower, but it is rather overloaded with bands of enrichment in the shape of quatrefoil diapering. There is a marked absence of buttresses about the church, those of the aisles extending only half-way up the walls. The somewhat debased form of arch, with the upper portion of each side composed of a straight line, is prevalent. The interior is much spoiled by the terrible "Early Victorian" Perpendicular roof. There is a peculiar porch, with seemingly a chamber over, to which there are neither windows nor means of access! Aldwinkle All Saints' is fine—Late Perpendicular, with a resemblance to Whiston. The tower is very good. St. Peter's is earlier (Early English and Decorated), more restored and less interesting.

Eight miles further down the Nene valley than Thrapston one arrives at the charming town of Oundle. Here is found abundance of good seventeenth-century houses, of stone, with lead-glazed windows, and the inevitable stone chimneys. I stayed at the "Talbot," itself one of the finest Jacobean houses in the town, with its buildings grouped round the court in good old-fashioned style, and a fine oak staircase, picturesquely wasteful of space in its plan. At the church is much that is interesting. First, there is the grand spire, strongly reminiscent of Kettering, having the same battlemented pinnacle and the same type of detail about the tower. The west door is worth careful study. The detail of the nave arcade is Early English, and some of the windows have good Perpendicular tracery; but two features attracted my

attention more than any others—the lectern and the south porch. This latter is Perpendicular of the end of the fifteenth century, and the detail is peculiarly rich. The vaulting inside is very good. The brass lectern, said to have come from Fotheringhay Castle, I measured. The bird is very vigorous, as are also the three strange natural-history specimens which form the feet, but the noteworthy feature is the flattened form of the orb, which takes a very subtile line. Remark also the delicacy of the mouldings on the shaft, many consisting simply of the most gentle possible wave of the surface to catch the light. The pulpit is interesting (fourteenth century), painted black, with gilded lead stars affixed to the panels, and touched up here and there in red and gold.

At this stage of my tour I at last came across a really fine example of Early English—Warmington Church. Its south porch [fig. 139] is particularly good, and the mouldings of the arches are of the best. I observed the lightness of the nave arcade, conjoined with the wood vaulting above—the splendid foliated caps which carry this vaulting—the beautiful windows of the south aisle, rich in dog-tooth, and the flatness of the roofs. The tower and broach-spire are vigorous and good, and certainly the broach is seen here at its best, suiting the squat proportions of the spire as completely as it disagreed with the loftiness and size of that at Raunds. The west door is fine. A mile or so off is the church of Fotheringhay, which looks so commanding at a distance. I confess to a feeling of disappointment with it on a near inspection. The details are all so huge and out of scale with the building, and the octagon lantern—in itself a very noble feature—seems to sit awkwardly on the tower below. In fact, the whole impression of the work is that it is coarse. The windows, however, have very fine tracery, and there is no doubt that the absence of the choir does much to interfere with the effect as a whole. Cotterstock Church has a gorgeous choir—large and lofty, with splendid curvilinear Decorated windows. Attached to this is the little Early English church, and the curious discrepancy of proportion between church and choir is due to the fact that here a college was established in 1337. On the floor of the chancel is a fine fifteenth-century brass. The very fine little Perpendicular porch is, perhaps, the feature most worthy of study in this church. It has a rich vaulted ceiling, with good carved bosses. A feature I have not elsewhere observed is seen on the outside, in the cornice-string along the two sides. This dips down to the centre, where there is a large, grotesque spout, the idea evidently being to express the fall of the gutter on the other side of the parapet.

I reached Peterborough on 28th August, the last stage of my tour. To one arriving as I did at the south end of the town, the Cathedral bursts into view with a suddenness that takes one's breath away, as one turns to the right and passes under the arch of the gateway. There is something startling, almost theatrical in it. There it is, all in a moment, and in all the glory of its gloriously beautiful—frankly untruthful west front. As one draws nearer, the eye rests on the little Perpendicular porch which has been inserted beneath the central archway, and discovers another thing of beauty—fine in proportion and in details, though marring the effect of the greater and earlier portico in which it is set. I noted the " dodgey " springer to the arch of

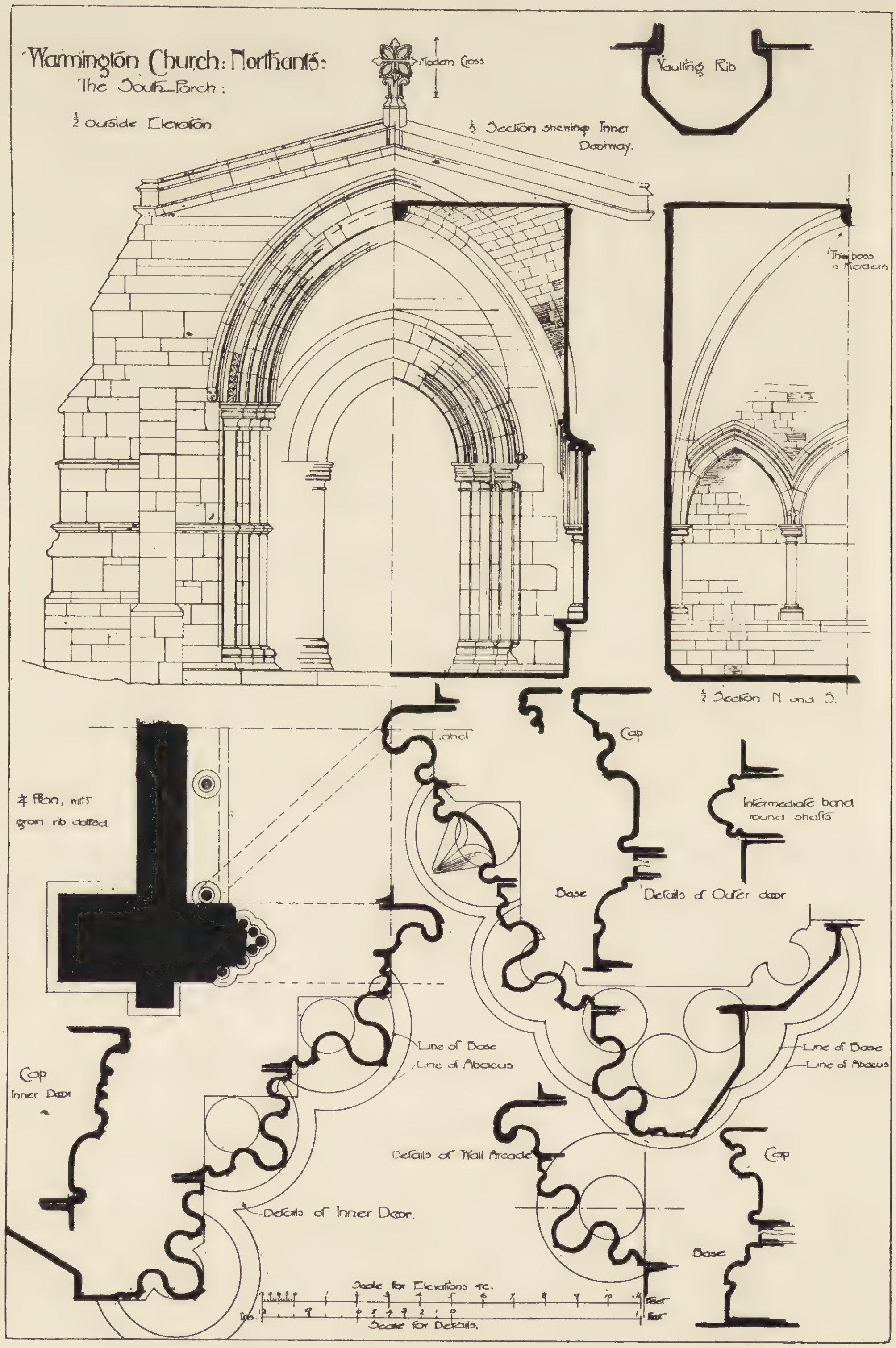


FIG. 139.—SOUTH PORCH OF WARMINGTON CHURCH.

this porch, and the skilful way in which the buttresses are diminished. Within I found the church in something of the condition of a builder's yard, a great hoarding separating the nave and choir, and the choir filled with temporary stalls. The hoardings, makeshift boarded vestibules, red cloth hangings, and large printed bills with directions to visitors, were all suggestive of some such function as a cattle show or a race meeting. The restorations are all but completed, and seem to be very faithful, very thorough. An instance of this faithfulness some may be inclined to criticise, where in the great west arch of the central tower the Decorated caps of the inner order were found to have been wrought on the backs of the Norman caps of the original work. The stones have now been turned round, so that the Norman caps are outwards, and appear amongst their later brethren, and under the Late arch, like a resuscitated Ancient Briton in a modern drawing-room. After putting myself under the guidance of a verger, and having been taken round in the orthodox way, I settled down to a drawing of the Early English font. This done, I merely roamed about sketching here and there; for the spirit of work had departed, and I was not sorry when the time arrived to leave the scene of my long tour, and return once more to the humdrum of ordinary life, after more than ten weeks of work and wandering.

JOHN BEGG.

*** All the illustrations to this Paper are reproduced from pen-and-ink sketches prepared expressly by Mr. Begg. The original drawings made by him during his tour, a list of which was given in *The R.I.B.A. Journal* [vol. vii., p. 131], were exhibited at the annual exhibition of students' drawings, held at the Institute in January 1891.

CI.

THE FIREPLACE AND ITS ACCESSORIES. A Prize Essay.—By MR. CHARLES E. SAYER, *Associate*; *Tite Prizeman* 1879 and *Institute Silver Medallist* 1892.

[*Addressed to the Council.*]

MR. PRESIDENT AND GENTLEMEN,—

THE architectural treatment of the fireplace and its accessories is a subject which can scarcely be dealt with in an Essay otherwise than historically. To attempt to show what this treatment should be in the present or future would be mere phrase-making, unless accompanied by original designs; to attempt to show what it has been in the past may be instructive, and help to deduce principles for future guidance. In the following pages an endeavour has been made to trace the evolution of the fireplace from its most primitive to its present form. The subject may be divided under three heads: Structural, Monumental, and Decorative; corresponding roughly to the Mediæval, the Renaissance, and the modern periods of Art.*

The oldest indoor fireplace was undoubtedly the open hearth in the middle of the building, house-place, or hall; the most primitive form of which is still to be seen in the lodge or wigwam of the North American Indian. Originally a mere bonfire built on the floor of beaten earth, this first fireplace developed by degrees. The obvious improvement of a hearth of stone or brick somewhat raised above the floor gives us the first *structural* fireplace. The necessity of getting a draught of air into the middle of the fuel would lead to raising the logs, first on other logs, and later,

* The subject is pre-eminently one dependent for its interest and even its intelligibility on the illustrations, but it was obviously impossible to publish all the seventy or more sent in with the original Essay. The principle of selection followed has been to omit (except where absolutely necessary) all those examples with which architects generally are familiar, or which are easily accessible (references to these are given in several cases). I am indebted to Messrs. M. Feetham & Co. for permission to publish sketches and photographs of old grates, backs, and dogs in their possession. I am also indebted to Mr. Bedford Lemere for permission to publish copyright photographs and for kind assistance. In the choice and arrangement of the illustrations, two points are to be noticed. *First*, the examples chosen are not necessarily the finest or most artistic of their period, but rather those which exemplify most clearly the points to be insisted upon—which, in fact, best *illustrate* the text. *Secondly*, there has been no attempt (at least in the earlier periods) to arrange them in strictly chronological order. Occasionally the only available example of an early development is to be found in a later survival; and thus the sequence of ideas is followed rather than the sequence of time.—C. E. S.

on supports of masonry or metal, whence andirons or dogs. A fender or curb of some kind to confine the embers would be an elementary precaution against fire in the rush-strewn halls, and so the perfected form, as we see it at Penshurst, must have been early arrived at [fig. 140].

In the rude huts and wooden halls of our Celtic or Norse forefathers there was no special arrangement for the escape of smoke, a state of things still to be found in Irish cabins and Highland shielings, and almost universally in Iceland, and the casual ventilation afforded by an open door or shutter satisfied the modest requirements of this elder age. When, however, innovating spirits began to entertain the daring idea of excluding (by rude glazing of horn, or still ruder shutters) the free entrance of the gales of heaven, the mere exigencies of breathing required some exit for the smoke: hence a hole in the roof.

This hole, if large enough to answer its purpose readily, would naturally afford entrance not only to the rain, but also to sudden gusts of wind, which in stormy weather would altogether defeat the purpose of the aperture. The idea of a covering of some sort, raised above the roof sufficiently to allow of the escape of smoke whilst preventing the direct entrance of the rain, would presumably be the next step in advance; the addition of baffles or wind-guards for the prevention of down-blow would naturally follow, and the arrangement in its more perfected and elaborated form became the "louvre" (French *l'ouvert*, the opening), from which we get louvre-boards, and which may be regarded as the prototype of the modern "extracting cowl."

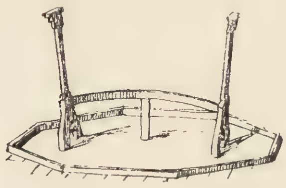


FIG. 140.—IN THE GREAT HALL AT PENSHURST.

The whole arrangement must be admitted—taking the means employed into consideration—to be the most economical and efficient possible method of warming large apartments; nor will any one accustomed to wood fires be disposed to attach great importance to the smoke drawback. The absence of soot and the height of most halls prevented it being regarded as a nuisance; on the contrary, a *laudator temporis acti* of Elizabeth's day writes thus:—"Now have we "many chimneys, and yet our tenderlings complaine of rhumes, catarhs, and poses. "Then had we none but reredoses, and our heads did never ake, for as the smoke in "those daies was supposed to be sufficient hardening for the timber of the house, so it "was reputed a far better medicine to keep the good man and his familie from the "quacke or pose, wherewith as then verie few were oft acquainted." Nor was this primitive method of warming superseded by the introduction of chimneys; it continued side by side with them for centuries, and was not finally abandoned until the custom of having upper floors over the halls, &c., made its use impossible. Indeed, there are people still living who can remember to have seen the halls of Oxford Colleges and of Westminster School warmed by braziers of coke in the middle.

The fact that the earliest chimneys are to be found in the donjons or keeps of castles, is to be accounted for by the structural necessity of having several storeys, and a flat roof or fighting deck over all, and not, as might be supposed, by the superior

wealth or refinement of the nobles who, when they built peaceful halls, returned, as a matter of course, to the primitive open hearth.

In ancient Rome and the southern parts of Europe generally the original open hearth developed into the braziers still in use in Spain and Italy, of which some beautiful antique examples have been found at Pompeii and elsewhere. The use of charcoal and the warmth of the climate, with the general absence of doors, rendered chimneys superfluous in the living-rooms; nor, as far as can be ascertained, do they appear to have been used at Pompeii even in kitchens. The cooking arrangements seem to have been precisely similar to those still in use in the south of Italy—i.e. small square holes sunk in tables of solid brickwork for the reception of charcoal. In ancient Rome, however, where the houses were of many storeys—one tenement or flat above another—chimneys of some sort must have been a necessity; and the *hypocaustum*, or furnace for heating the bath, shows that the Romans were well acquainted with flues. The fireplace in the primitive dwelling was used primarily for cooking purposes, and only secondarily for warmth. The inconveniences of this double function would, as civilisation advanced, make themselves felt. To cook before a single fire in a living-room for any number of people must have been exceedingly difficult, especially in times when flesh food formed practically the entire diet, and accordingly we see in the Bayeux Tapestry and in early MSS. representations of cooking in the open air. This was probably done in emergencies, but if required for long together would lead to the erection of temporary shelters or sheds: hence the first detached kitchens. These buildings, originally of wood,—and, when they became more permanent, of wattles and mud,—appear to have been of circular shape, with the louvre or funnel for the escape of smoke at the top—to have been, in fact, gigantic chimneys, with still a single fire in the middle, and not unlike our modern oast-houses. Viollet-Le-Duc mentions that the sites of several of these circular cooking-places have been discovered within the walls of early Norman castles.

In this connection it is interesting to note the resemblance some of the old chimney-tops bear to louvres—as, for instance, at the Bishop's Palace, Southwell, at Motcombe (Dorset), at Burford (Oxon.), and other places. These, on dissection, seem to show plain indications of a wooden origin. Subsequently, as need or occasion arose, one or more smaller circles, each with its own funnel and opening into the main kitchen, appear to have clustered round it. This form of kitchen, executed in masonry, is exemplified in the "culina antiqua" of the Abbey of Marmoutier, near Tours, of which a plan and section are given by Viollet-Le-Duc, the materials for which he drew from the *Monographie des Abbayes de France* [figs. 141, 142]. The form of this building seems undoubtedly to have been suggested by one of wattle and mud. Any one planting stout saplings in a ring, and bringing the smaller ends together to form a funnel, with one or two strengthening bands round the whole, and wattling between, would almost inevitably arrive at this form, as witness in miniature the wicker-bottle to hold pool-balls.

When separate apartments began to be added, for the family use, to the primitive

house-place, the necessity of warming them would naturally lead to the importation from the kitchen of some form of funnel or chimney to carry off the smoke, the thing, as well as its name, probably coming to us from France. The earliest existing chimney in this country, if authentic, is perhaps one in Arundel Castle, which is asserted to date from the time of Alfred the Great (he was a traveller in his youth, and his grandfather, Egbert, spent some time in exile at the Court of Charlemagne, whence he may have brought the idea). This chimney much resembles that at Colchester Castle mentioned later. But setting aside this somewhat doubtful example, we undoubtedly find the fireplace proper (or open hearth) and the more modern chimney side by side as early as the eleventh century.

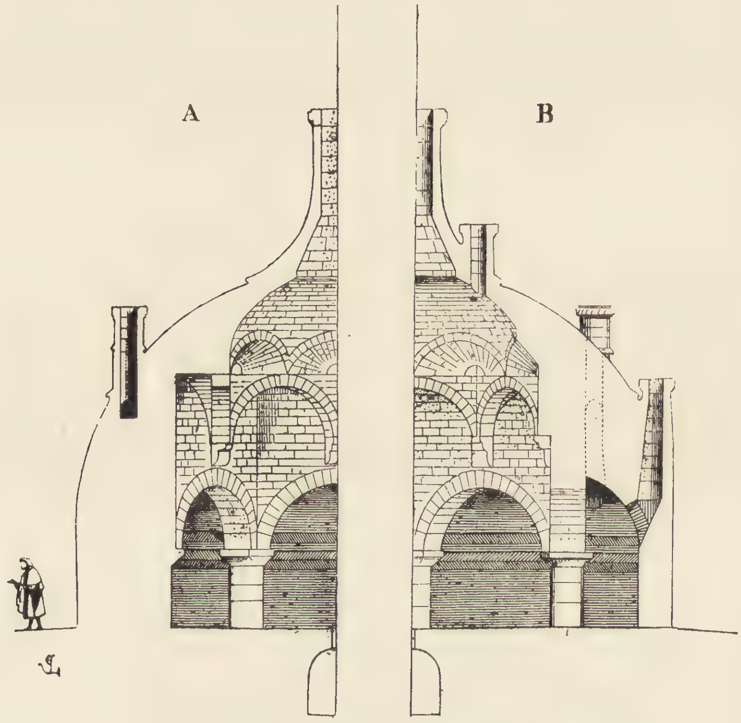


Fig. 141.—A, Half-section on the Line L K (see Plan). B, Half-section on the Line K N (see Plan).

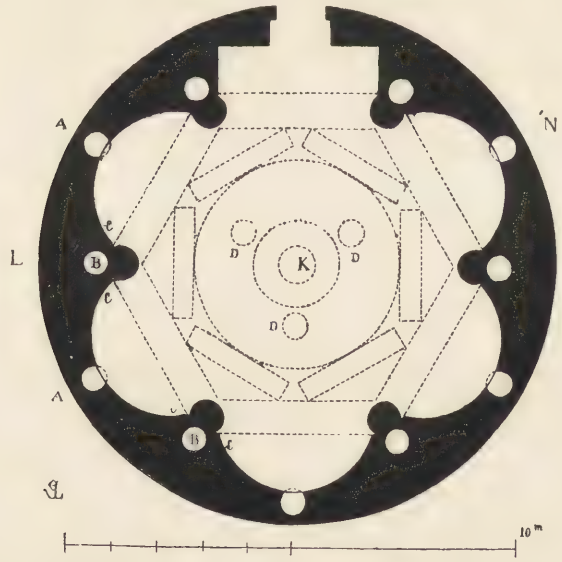


Fig. 142.—Plan of Isolated Kitchen, with Five Fireplaces.
L K, Line of section A ; and K N, line of section B (see fig. 141). A, A, Flues. B, B, Flues. c, c, Two mouths of flue B. D D D, Openings in the vault. K, Central opening.
KITCHEN AT THE ABBEY OF MARMOUTIER, NEAR TOURS, FRANCE.
(From Viollet-Le-Duc's *Dictionnaire*, Art. *Cuisine.*)

Here must be noticed a very curious development of the original open hearth in the northern parts of Europe, and typically in Germany. At first sight it may seem unlikely that the close stove, so universal in these countries, could be a descendant of

the central open fire; yet such appears to be the case. The severity of the climate in Northern Europe rendering it quite impossible to warm the houses by any description of wall fireplace, these appear to have been scarcely attempted; and where the open fire was in the nature of things impossible, a contrivance somewhat in the nature of the hypocaustum took its place. The heat-absorbing power of bricks must have been early known, and the earliest form of stove probably was a square box of bricks, in which a fire was lighted, closed up, and suffered to burn itself gradually out, the heat absorbed by the bricks being retained in them sufficiently long to last through the night.* Further improvements on this took the form of added passages or flues to increase the surface of brick to be heated, and on the top of such a stove a bed was frequently made, especially for the aged and infirm. The addition of a flue would, of course, enable the fire to be kept up constantly, and would give the rude original of the modern stove, although a flue is not invariably found even in the latter, the old practice of a smouldering fire in an almost air-tight box being still sometimes followed. Several examples of these stoves will be noticed further on in their artistic sequence.

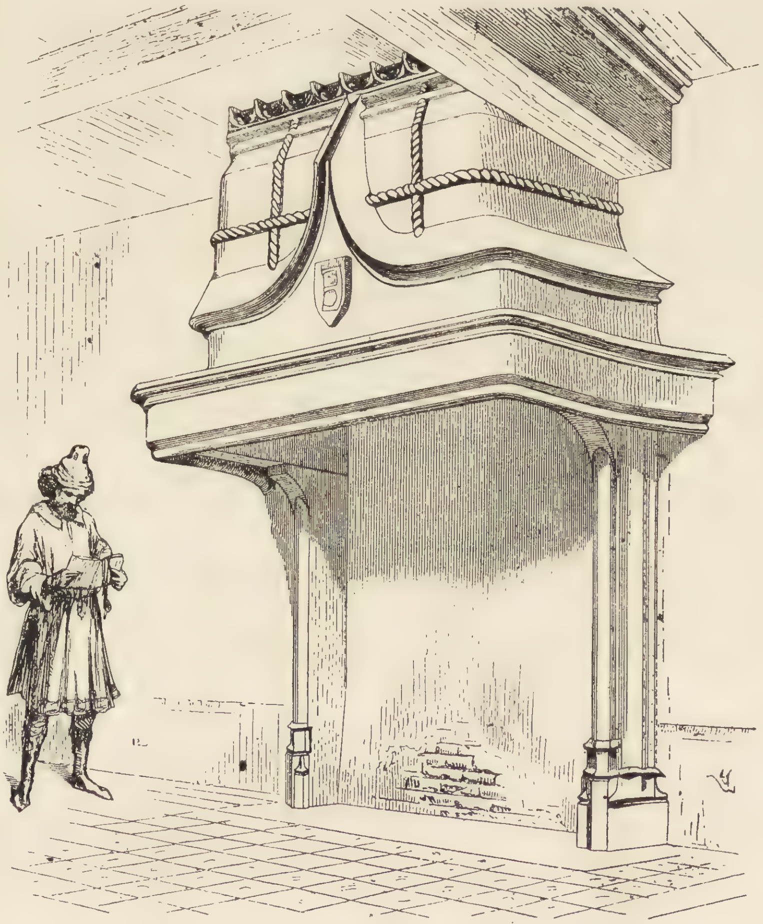


FIG. 143.—AT SAINT-ANTONIN (TARN-ET-GARONNE), FRANCE.
(From Viollet-Le-Duc's *Dictionnaire*, Art. *Cheminée.*)

We must now follow the wall-fireplace, and very soon we find two distinct types, *Hooded* and *Recessed* chimneys. The hooded is perhaps the earlier form, as being obviously more easily applied to existing buildings. The hood at first was made of

* Bread ovens are still sometimes heated in this manner.—C. E. S.

timber or wattle and clay, and was probably of semicircular shape, or it had a wooden "mantel-tree," as in the "solar" at Stokesay Castle (a drawing of which is given in Parker's *Glossary*), and this practice continued till a comparatively late period, Viollet-Le-Duc giving two charming examples of hoods in wood and plaster from Saint-Antonin, in the Tarn-et-Garonne, dating from the fifteenth century [fig. 143].

A good example of the recessed chimney, to be found at Rochester Castle, has much the appearance of a circular arched door. A very early example also is that of Colchester [fig. 144], which, it will be seen, is semicircular in plan; it has no flue in our sense of the word, but two small tunnels going horizontally through the wall, a little above the arch, provided an uncertain escape for the smoke. This is probably the earliest form of recessed fireplace, and the examples at Lincoln

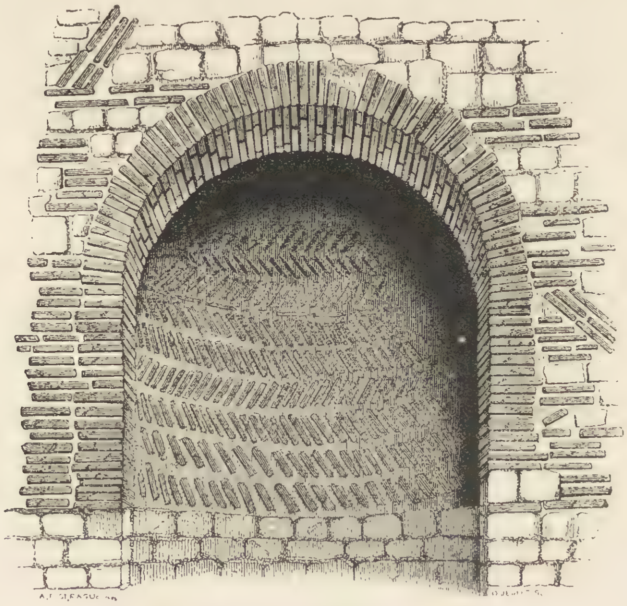


Fig. 144.—At Colchester Castle.

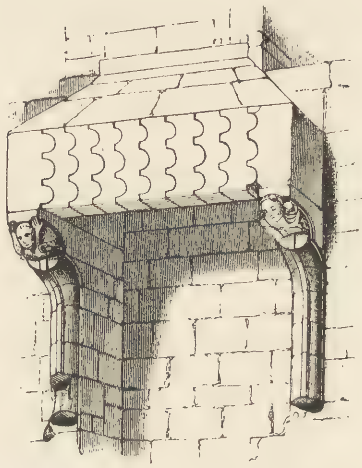


Fig. 145.—At Edlingham Castle, Northumberland.

(From Hudson-Turner and Parker's *Domestic Architecture in England.*)

Cathedral and Aydon Castle show that even in the thirteenth century it was not deemed necessary to carry flues to the top of the building; indeed, chimneys on the Colchester principle were not uncommon as late as Elizabeth's time, when they were called "court chimneys." Of the hooded chimneys scarcely any examples exist earlier than the thirteenth century, the method of constructing them, as explained above, being of course accountable for this.

From this point the evolution of the chimney and fireplace is gradual but continuous. The evident disadvantages of the wooden beam or mantel-tree for supporting the chimney breast or hood, and the difficulty in many districts of finding stones of sufficient scantling to replace it, led to various attempts to form a straight arch for the purpose. Obviously an ordinary arch with tapered voussoirs was unsuitable for the hooded form of chimney on account of the absence of abutment, and the Mediæval

masons set themselves to overcome this by notching the stones one into the other, as at Boothby Pagnall and elsewhere, or by an ingenious system of joggles, as in the very characteristic example at Edlingham Castle [fig. 145], where the mantel is really a composite stone beam, and not an arch at all.

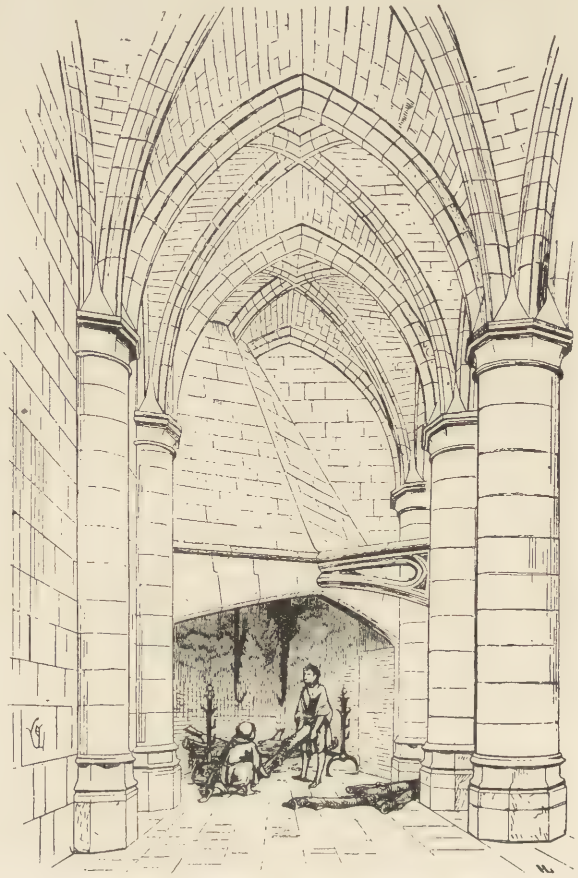


Fig. 146.—At the Palais de Justice, Paris.
(From Viollet-Le-Duc's *Dictionnaire.*)

The kitchen in the old Palais de Justice, Paris, furnishes an example of another expedient, an extraordinarily clever piece of logical construction, where the centre of the arch jutting out is counterbalanced by a sort of flying-buttress from an adjoining column [fig. 146]. A famous example of the purely recessed type in France cannot be overlooked—namely, the splendid series of three fireplaces in the great hall of the old Palace of the Counts of Poitiers. The flues of these fireplaces are carried up right through the tracery of the great window over.

The difficulty of construction, and probably a tendency to smoke, seem to have brought about the disuse of the hooded chimney, at least in this country, although in France and Italy the type was almost universal, and retained until well into the seventeenth century.

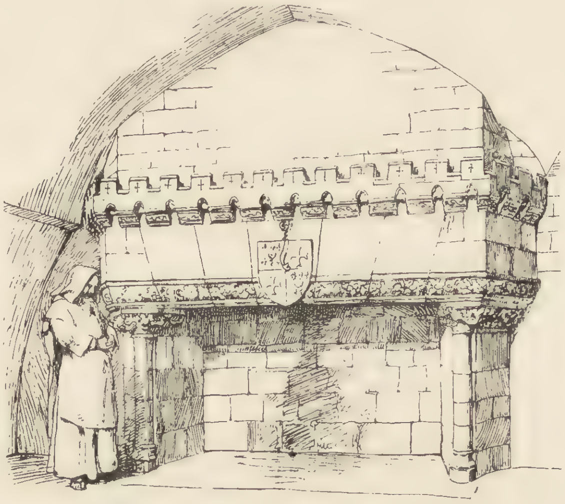


Fig. 147.—At the Bishop's Palace, Angers.

A combination of the recessed and hooded types was common enough, an early example being found at Aydon Castle, Northumberland. This transitional form is carried still further in a fireplace at the Bishop's Palace, Angers [fig. 147], constructed by the first Bishop of that See. It has a

singularly English appearance, and it will be observed that the hooded form, although suggested, is more apparent than real. This chimney, which is a very good and mature

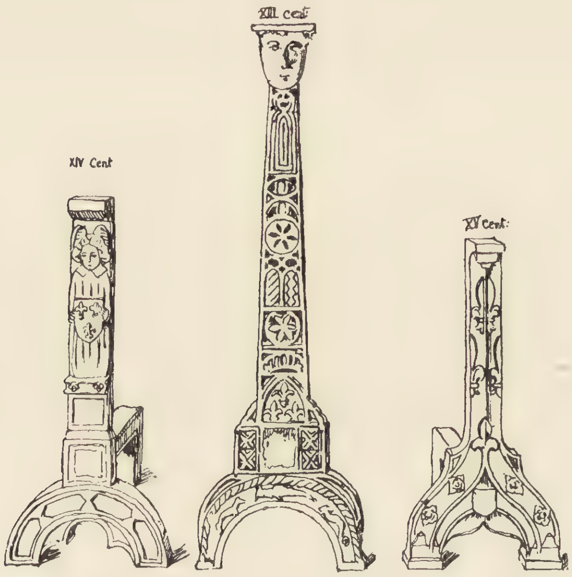


Fig. 148.—Cast-Iron Fire-dogs, in Cluny Museum.

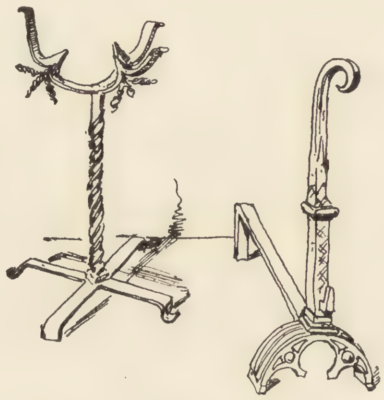


Fig. 149.—Wrought-Iron Cresset Stand and Dog from the Bargello Florence.

example of the Mediæval type, seems admirably constructed from a practical point of view; and, unlike the examples previously considered, which have been almost wholly structural, has a good deal of ornament. It may, perhaps, be doubtful how far the introduction of essentially external features, such as battlements and machicolations, is justifiable, but the artistic dignity and sincerity of the whole composition cannot be denied.

Fig. 150.—Cast-Iron Fire-dog.

The celebrated fireplaces at Tattershall Castle (casts of which are at the South Kensington Museum), with their armorial achievements and heraldic marshalling, may, perhaps, fitly close the review of the Mediæval or structural fireplace. Examples might be multiplied, but our present purpose requires us to confine ourselves to "types." The fittings of Mediæval chimneys were of the simplest kind, and consisted mainly of wrought-iron dogs, of which the examples remaining have (either for use or as survivals) hooks for holding the spits, to be turned by lads, and later by a special breed of dogs known as turnspits. The group of three cast-iron "dogs" in the Cluny Museum [fig. 148] are among the few ornamental ones remaining. Interesting as early examples of cast-iron, they seem to

show that the Mediæval treatment of the material was based on that of wood (of which the patterns were made). Cast-iron " backs " do not appear to have been in use at this period, and it was usual to insert an arch in the backs of chimneys, so that the portion of masonry acted on by the fire could be readily removed and renewed. A fire-dog and cradle at the Bargello, Florence [fig. 149], are good examples of Mediæval wrought-ironwork. The latter seems to have been intended to hold a cresset of some sort, and this raising of the fire from the hearth may perhaps account for the great height observable in all Italian fireplace openings. At Haddon Hall are to be found well-known examples of complete fire-grates dating from the reign of Henry VIII., and a cast-iron dog, perhaps German, given here [fig. 150], belongs in style, if not in date, to the Mediæval period.

The term fire-*grate* (and the thing itself) may have originated in this way : In many old houses where wood is burnt, a simple contrivance is found in the less important chimneys, namely, low hobs of brickwork, with a flat iron grate resting on them. This is still in use at Littlecote, Wilts, and serves its purpose well. The addition of uprights to prevent the logs falling forward brings us to the embryo fire-grate as at Haddon.

Here it will be proper to notice the more modern development of the stove or enclosed fireplace, three fine German specimens of which are to be found in the Keramic Gallery at the South Kensington Museum. The earliest of these in point of style, although the Museum authorities have labelled it "about 1600," is a fine specimen, in green enamelled porcelain, of the style of ornament peculiar to the latest phase of German Gothic. It does not appear to have had any flue, and the corrugation of the surface, especially in the upper or circular portion, ingeniously increases the radiating surface. The second example, which is of an advanced Renaissance character, is happily signed by Hans Kraut, the most celebrated stovemaker of that time, and dated 1578. It is enamelled in two shades of green, with yellow and orange, some of the panels being modelled in high relief, and others painted in flat colour ; a seat is provided which one would think must have been too warm to be comfortable. This stove has evidently had a flue from behind the seat, underneath which is the furnace door, and it probably stood against the wall on this side, and was fed from the passage without. The third example, though belonging to a much later period, is noticed here to close the subject. It is a very monumental structure of the Louis-Quatorze period, and is labelled "about 1700," which is probably the approximate date. It is of buff glazed terra-cotta, with abundant ornament in the Louis-Quatorze style, much of it boldly and well modelled. Judging by the wall attachment, this stove also was fed from without the room ; it probably had no flue-pipe.

There was, of course, no violent transition from the Mediæval or structural to the monumental or Renaissance chimney. Many of the later Mediæval examples are monumental, and many in the Renaissance period continued to be wholly structural.

The commencement of this new era, however, was marked by a divergence in practice between England and the Continent, already briefly alluded to. Fireplaces

in this country were almost invariably recessed, those on the Continent almost invariably hooded. The former is the more practical, and, if there be any truth in the doctrine of the survival of the fittest, the better form; for it has held almost undisputed possession everywhere for the last two centuries. The hooded form, however, has much greater artistic possibilities, and this fact, together with the more genial climate, probably explains its continuance in France, and, above all, in Italy.

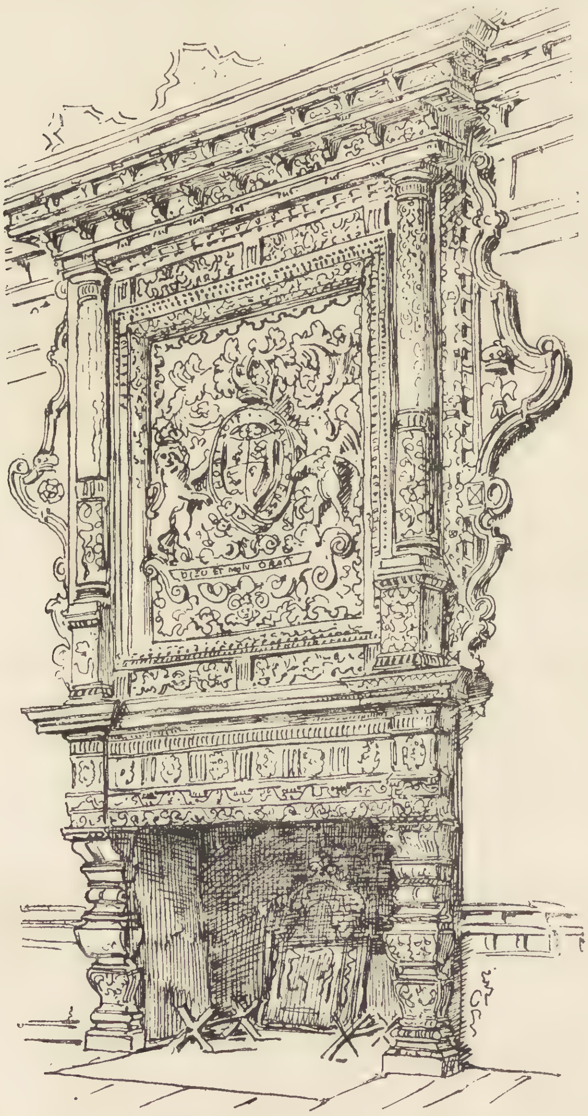


Fig. 151.—In the Great Chamber, Combe Abbey.
(Traced from Richardson's *Architectural Remains of Elizabeth and James I.*)

The extraordinary wealth of artistic genius lavished at this time upon buildings and their accessories in these two countries and the Netherlands renders it necessary to follow the artistic evolution of the fireplace through the examples which they supply so abundantly, but it will be well here to trace the native type to its practical disappearance. The purely structural fireplace, then, continued in use until the middle of the seventeenth century, as the simple stone arch and jambs framed in the panelling of so many manor-houses in all parts of the country clearly show; and it is significant of its origin that these have almost all retained some form of pointed arch, though in most cases as an ornamental survival.

The Elizabethan and Jacobean periods afford many examples of a monumental type, in which profusion of ornament and richness of material are the most conspicuous features, and in these respects the wealthy Englishman's chimney-piece of this age was only equalled by his tomb. A good example is to be found at Combe Abbey [fig. 151]. There is a later one at Loseley [fig. 152], and there are several at Hatfield.

These elaborate compositions, in spite of the glamour of age and historical associations, must be admitted, from an artistic point of view, to be very inferior to

their contemporaries on the Continent; and seeing their frequently coarse and rude workmanship, it is difficult to account for the persistent traditions which assign so many of them to French or Italian sculptors. That such sculptors were frequently employed

Fig. 152.—At Loseley Park, near Guildford.
(From a photograph by Mr. Bedford Lemere.)

in this country, however, is abundantly evident. A seventeenth-century illustration,* given by Jusserand, of the Duchess of Newcastle's Hall, shows a foreign type of

* *The English Novel in the Time of Shakespeare.* By J. J. Jusserand. Translated from the French by Elizabeth Lee. 8o. Lond. 1890, p. 379.

hooded chimney, from which a puff of smoke is escaping into the room, and one of the gentlemen present in the act of opening the window, a practical object lesson to the admirer of exotic productions.

The sumptuous examples before mentioned were copied more or less successfully in the national material (oak) by those unable to afford the more expensive forms, and hence we get the combination of a structural fireplace with quasi-monumental accessories in oak, which has come to be recognised as typically Elizabethan. A good example is in the gallery at Burton Agnes, of which Richardson gives a drawing; and there is another, the stonework of which is modern, at Castle Ashby [fig. 153].

Turning now to the Continent, we find a very different development. The chimney-pieces in nearly all cases project into the room, and the decoration embraces the whole of the chimney-breast, and reaches from floor to ceiling, forming an harmonious whole. There is a magnificent series of these monumental chimneys in France and the Low Countries; those in the former showing strongly the influence of the Italian artists induced to settle in the country by the munificence of François I.

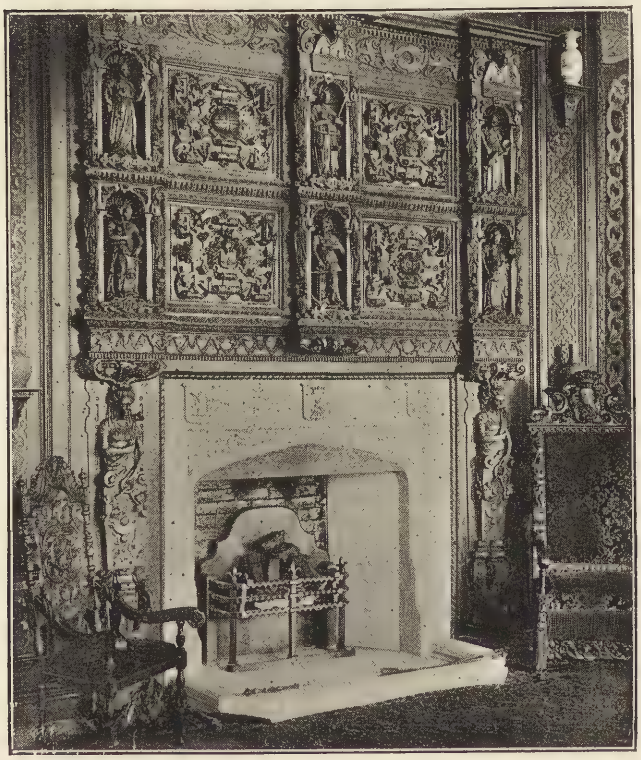


Fig. 153.—At Castle Ashby.
(From a photograph by Mr. Bedford Lemere.)

The remarkably beautiful but little known specimen at the Manoir de la Poissonière (Loir-et-Cher) may be taken as a type of the best work of this reign. The house was the home of the poet Ronsard, and certainly its decoration is most poetical. It is given in the first series of the *Encyclopédie d'Architecture*. A somewhat later example at the Château de Charenil, Alier (also given in that work), contrasts strongly with the last, and its frigid and somewhat affected classic dress does not appear to sit easily on it; in use it would probably smoke horribly.

There is a well-known example of the latter part of the fifteenth century at the Cluny Museum [fig. 154], with a bas-relief of Christ and the woman of Samaria over the mantel, bordered by caryatid figures and trophies of arms, excellent in effect and execution. It came from Chalons-sur-Marne. A later example, carrying out the same

idea, is, or was, in a house in the Place du Marché at Rheims, but the subject—the brazen serpent—is here *painted* on the stone [fig. 155]. Later, these chimneys became stiffer, more grandiose, and more "classical," till they assumed the full dress of the Louis-Quatorze epoch.

Fig. 154.—Carved Stone Chimney, now in the Cluny Museum.
(Reduced from a plate in the *Encyclopédie d'Architecture.*)

Examples found in the Low Countries, while following the same general lines as the last, have a very distinct character of their own. First may be cited the celebrated one in the Rathsaal at Courtray [fig. 156], the ornament of which still retains a strong Mediæval flavour—a characteristic feature being a sort of "trimmer arch," constructed after the fashion of fan-vaulting. This trimmer arch is common

to all the chimneys of this country and period; and, originally a constructive necessity, it is emphasised and made a decorative motive. A very fine stone fireplace from a house at Mechlin is more in the French style [fig. 157]. A later example is to be found at the Rathhaus at Antwerp, and a still later in the Brauhalle, in the same city. Both the last chimneys have oil-paintings in their overmantels, though these appear to be of later date, and the "trimmer arch" in the last-named seems to have

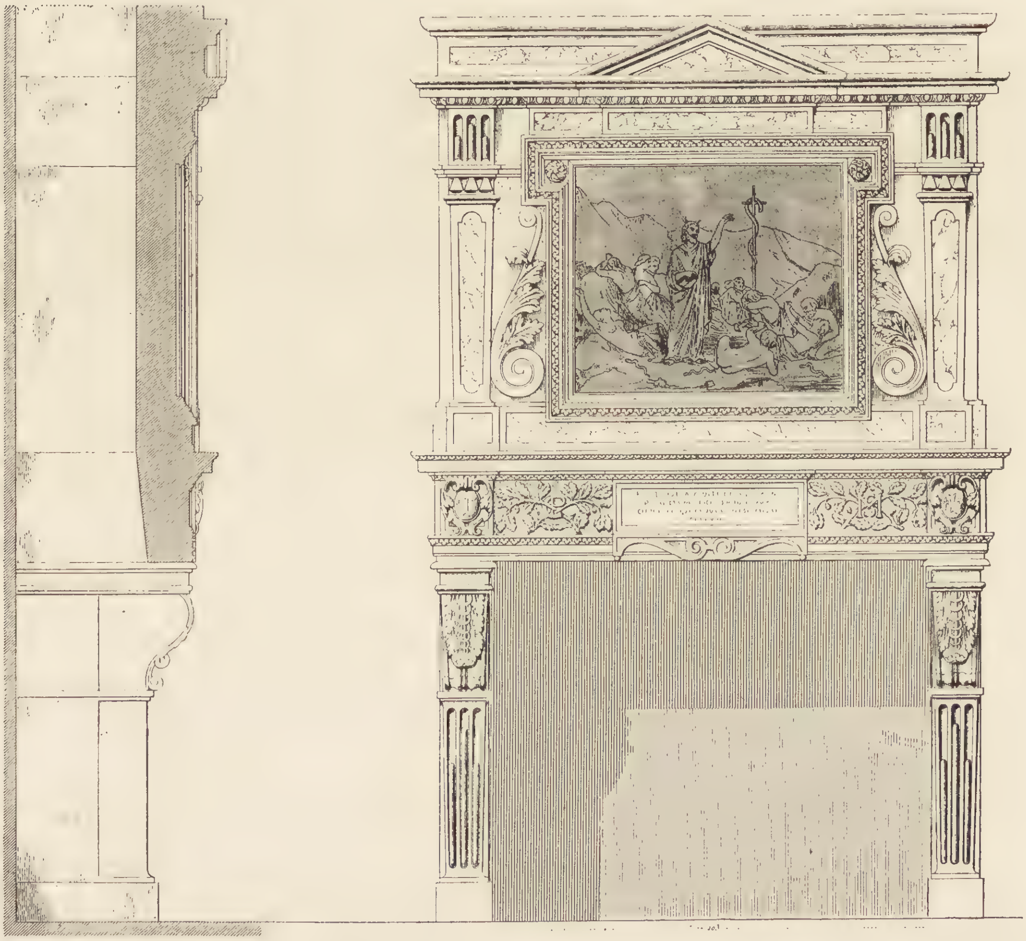


Fig. 155.—Painted Stone Chimney, Place du Marché, Rheims.

(Reduced from a plate in the *Encyclopédie d'Architecture.*)

been cut away to make room for the picture. All of the series are fine examples of the monumental chimney.

Fireplaces in Italy always have the effect of being intended for show rather than use; some very fine examples of the Cinque-Cento period are to be seen at South Kensington, both originals and casts. All are treated with the lavish and delicate sculptural ornament for which that period is unsurpassed. Beautiful as they were, they did not in any way affect the evolution of the fireplace, unless perhaps to retard

it in France. With respect to those of the seventeenth century, however, we shall see that they are most important links in the chain connecting the monumental with the modern types. They are usually comparatively narrow and high, and when recessed, are treated rather after the manner of low doorways.

FIG. 157.—IN A HOUSE AT MECHLIN.
(Sixteenth-century work.)

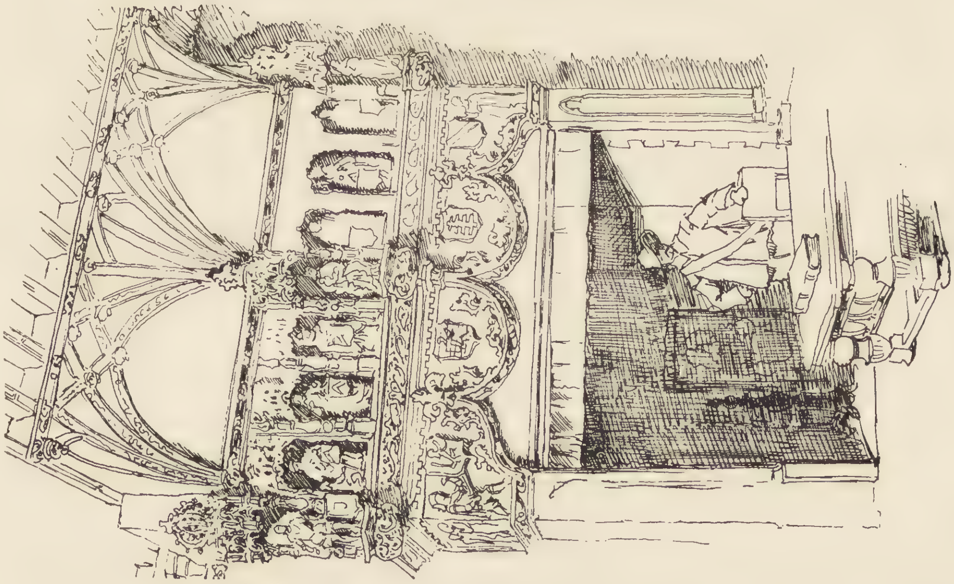


FIG. 156.—IN THE RATHSAAL AT COURTRAY.
(Early Sixteenth-century work.)

Serlio, in his fourth book of Architecture, published in Venice in 1537, gives some spirited examples designed to accord with the five orders. There is a Tuscan one boldly rusticated, with a plain square opening and a strangely modern American

look, and the Doric examples have various forms of triglyphs. One of the Ionic order [fig. 158] is crowned with a sort of prolonged Ionic cap above the architrave; it is intended for a less important room, and is recessed, the more ornate examples of every Order being of the hooded type.

A Corinthian example has a projecting hood, supported on curious terminal figures, with a sort of Egyptian appearance [fig. 159]. Another Corinthian example is recessed, the cornice being carried by consoles, with a garland suspended between

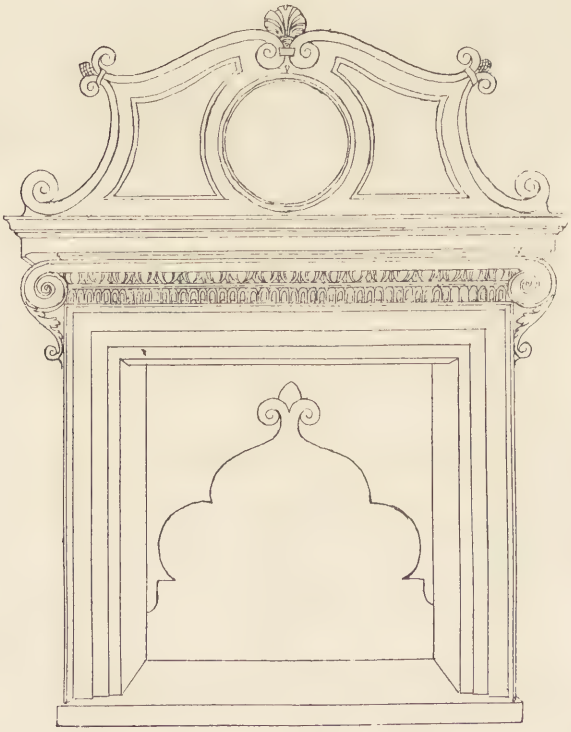


Fig. 158.—Chimney, of the Ionic Order.
(Reduced from Serlio, 1537.)

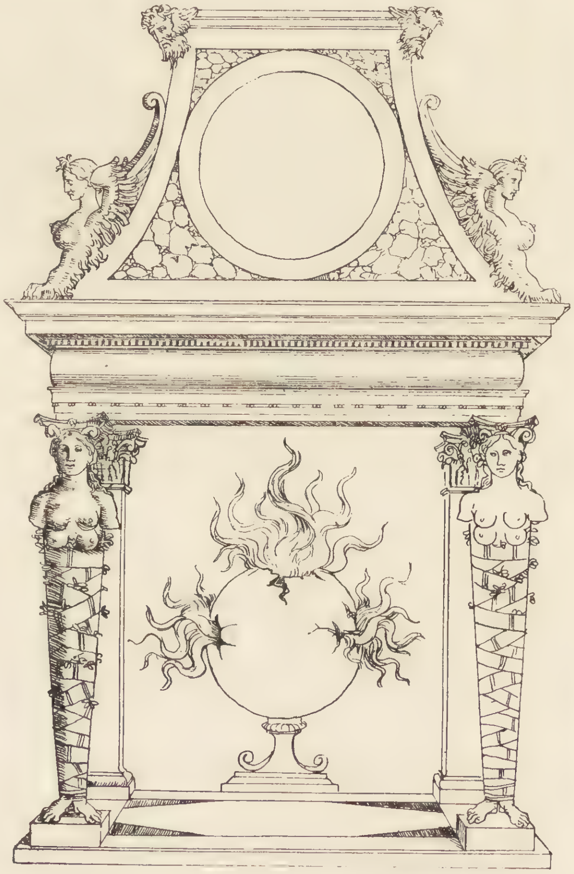


Fig. 159.—Chimney, of the Corinthian Order.
(Reduced from Serlio, 1537.)

them, across the frieze; this form is interesting as having been perhaps the prototype of Inigo Jones's chimney-pieces, and through him of the characteristic English eighteenth-century fireplaces.

Of the fireplace fittings of the Renaissance, abundant and fine examples remain. In France cast-iron firebacks began to be used, and one of these [fig. 160] has the Salamander of François I. The series of three cast-iron dogs given here [figs. 161, 162, 163] shows that the thirteenth-century idea of giving a semi-human form to them still survived in the sixteenth century. The first is French, and is well modelled,

though a good deal worn by fire and rust; the second is a very characteristic Elizabethan type, solid and heavy; the third is probably German, though coming from an old English country house.

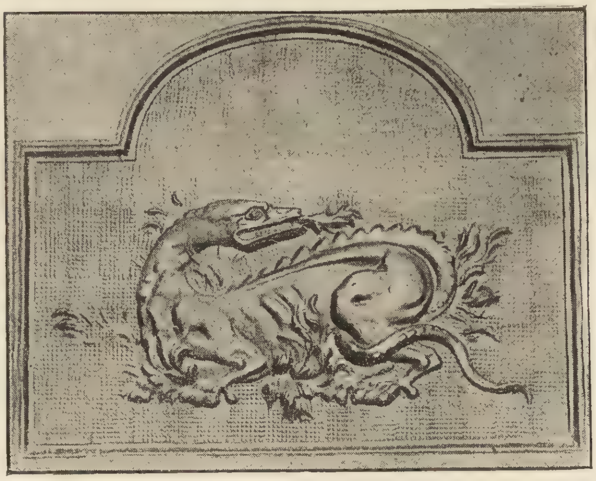


Fig. 160.—Cast-Iron Back with the Salamander of François I.

The magnificent Italian bronze dogs of this period, which were not infrequently imported into this country in the seventeenth century, belong really to the domain of sculpture. The pair given here [fig. 164] stand about three feet high, the crowning figures being the favourite ones of Vulcan and Venus. Mars, however, occasionally, as in fable, usurped the place of the former. Other figures, such as Neptune, the Roman emperors, &c., are also met with. Italian

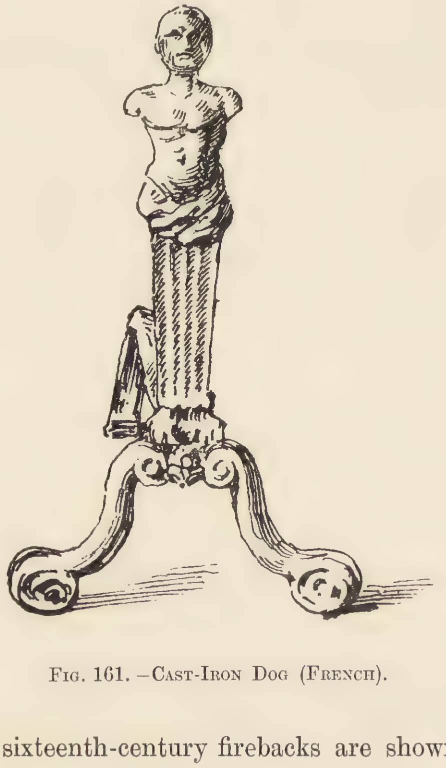


Fig. 161.—Cast-Iron Dog (French).

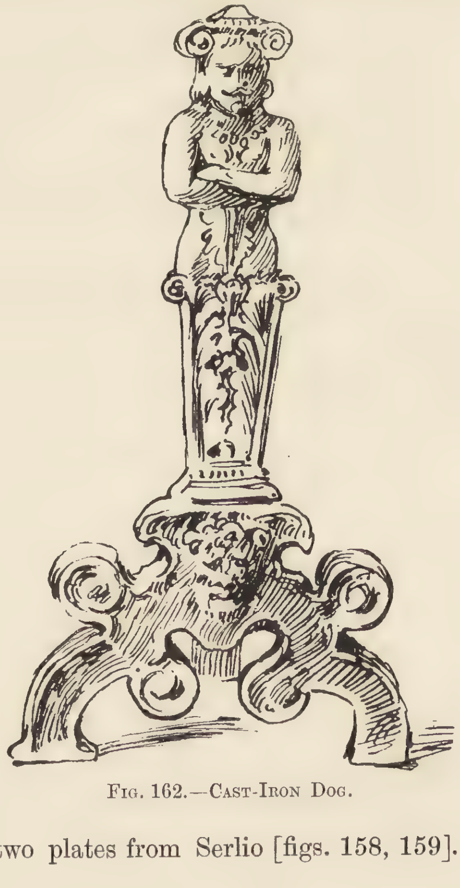


Fig. 162.—Cast-Iron Dog.

sixteenth-century firebacks are shown in the two plates from Serlio [figs. 158, 159].

The bombshell figured in one of them scarcely seems a desirable adjunct to the domestic hearth; it is perhaps meant to represent Greek fire, which was unquenchable, and curiously enough became a favourite ornament for fireplace accessories, being used in France as late as the Louis-Quinze period. If the illustration [fig. 152] of the fireplace at Loseley Park be carefully examined, there will be seen enclosed in a modern hot-air body the old arrangement for burning wood on the open hearth. The dogs, which are very fine specimens of hammered brass, dating probably from the reign of Charles I., rest on the hearth, but their irons, with secondary dogs or spikes to keep the burning brands from injuring the dogs, are raised upon a modern false

Fig. 163.—Cast-Iron Dog (German?)

Fig. 164.—Italian Dogs in Bronze.

hearth, with an open grate in front for the introduction of air, to be warmed in the hollow sides and discharged through the circular ventilators at the top.

In England at this period "sea coal" began to be generally used, though wood continued to be the fuel of the wealthy who had timber in plenty on their lands. The last fact accounts for the scarcity of examples of baskets used for burning the new fuel at this time. Early in the seventeenth century, we find what may practically be regarded as the origin of the modern or decorative chimney-piece. This, though an exotic introduced by Inigo Jones from Italy, executed in materials foreign to this country, such as marble, and probably by foreign workmen, has yet a character of its own essentially different from anything that preceded it; and although it virtually became extinct with the overthrow and death of its creator's munificent patron, it was

revived, as we shall see later, in the eighteenth century. Two examples of chimney-pieces by this master are given from Kent's book * [figs. 165, 166]. The stormy period of the Great Rebellion and the Puritan rule which followed were almost blank in the history of Art. The Restoration, and the return of so many of the nobility from France, introduced a French feeling into the buildings of the period, and especially their interiors, though the native simplicity and directness of those who executed them gave this feeling for the most part a distinctively English dress. Sir Christopher Wren—if we may judge from his work at Hampton Court—did not attempt to alter the style of interior decoration which had grown up under these circumstances, and the characteristic fireplace of the latter part of the seventeenth

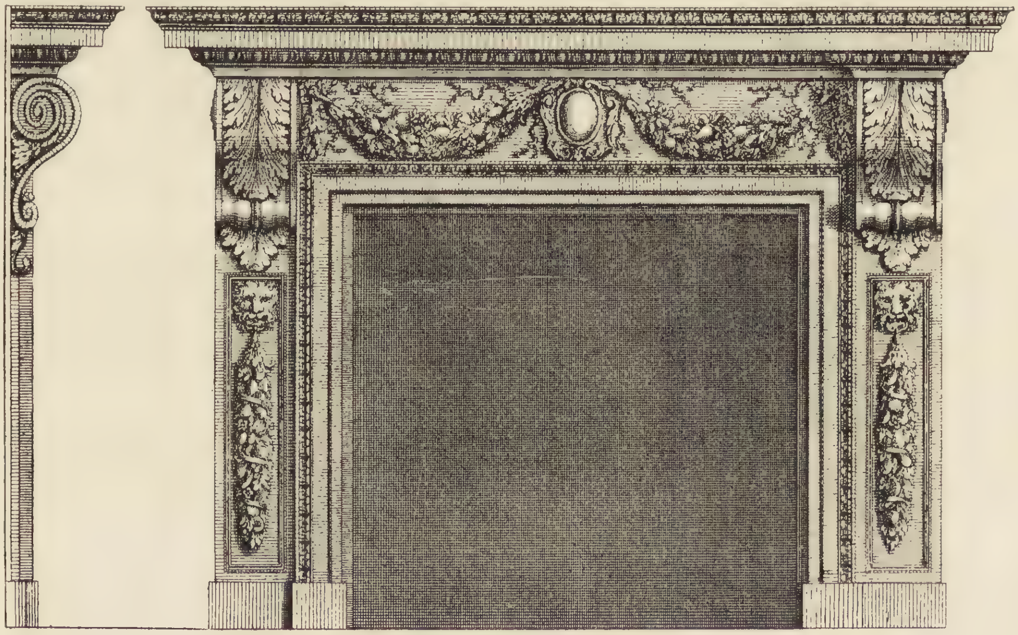


Fig. 165.—Chimney-Piece by Inigo Jones.
(Reduced from Kent's Book.)

century, with its boldly moulded marble frame alone dividing it from the surrounding wainscot, is there seen to perfection. It would be difficult to find a treatment of the fireplace at once so homely and so dignified, or one in which it seems more thoroughly to belong to the general treatment of the room. In these respects the latter part of the seventeenth century had, in a sense, returned to the Elizabethan model. A beautiful example of this time may be found in the Board Room of the New River Company [fig. 167.]

The fireplace at this period had really no shelf, and only a small cornice if rendered necessary by a set back in the masonry. There is an angle fireplace in one of the small rooms at Hampton Court [fig. 168], with a series of step-like shelves over it, which is one of the most quaint and charming arrangements that could possibly be

* *Some Designs of Mr. Inigo Jones and Mr. Wm. Kent.* Published by John Vardy. Fo. Lond. 1744.—C. E. S.

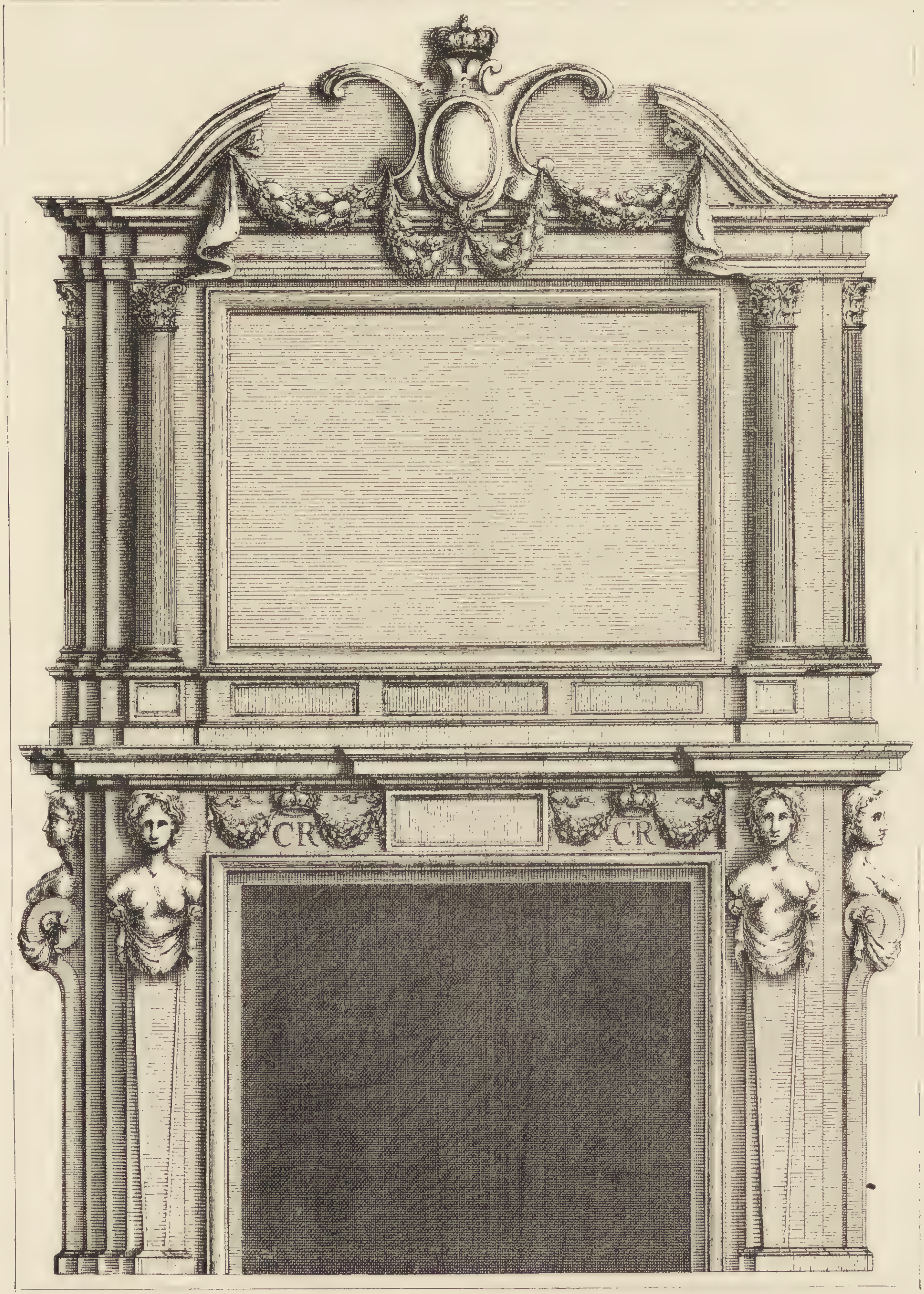


Fig. 166.—At Greenwich Palace: Inigo Jones. (From Kent's Book.)

imagined. The bold marble mantel mouldings of this period, ranging from 8 in. to 1 ft. or more in width, which exist in very great variety all over the country, form of themselves an admirable study in the design of mouldings. The fireplaces at Hampton Court show also moulded marble sides or linings, and these seem to have been the

Fig. 167.—In the New River Company's Board Room.
(From a photograph by Mr. Bedford Lemere.)

first departure from the plain square opening of masonry which had been universal since the abandonment of the earliest semicircular plan. The interiors of fireplaces changed but little in this century, being still arranged in the finer houses to burn wood. We must not omit to notice, however, the characteristic firebacks of the period.

These began in the sixteenth century with rude castings of the arms or cognisance of the owner: a very good example exists with the arms of Charles I. There is another of the period of Charles II.: the Royal Oak, with the crowns of the three kingdoms hanging in its branches, and commemorating the well-known incident at Boscobel.

The Dutch in the seventeenth century seem to have first given up the armorial idea, and substituted therefor rudely modelled emblematic figures on homely "Bow-pots." These backs were very largely imported and copied in this country, and modern castings from them are frequently used at the present day. A very fine one commemorates the close of the Thirty Years' War, and another well-known pattern represents Holland sitting in the midst of her dykes. The fireplaces at Hampton Court have all Dutch backs, looking rather coarse and out of place there, and insignificant dogs.

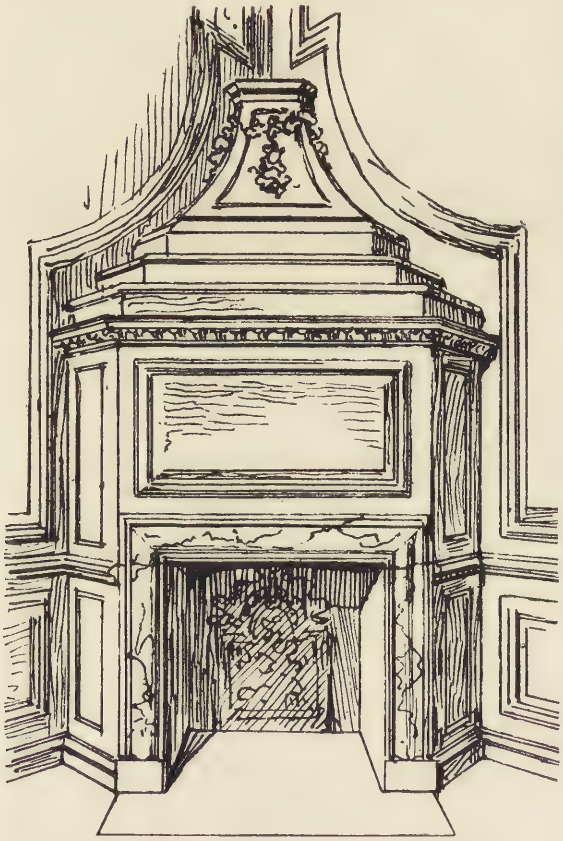


Fig. 168.—Angle Fireplace at Hampton Court.
[See page 405 *ante.*]

The great architects of the early part of the eighteenth century—Vanbrugh, Kent, and Gibbs—turned their attention to the works of Inigo Jones, and to a greater or less extent drew their inspiration from him. The style of chimney-piece he had introduced was revived, and became the eighteenth-century type, passing through various gradations, from the massive boldness of the earlier Queen-Anne work to the extremely delicate work of the Brothers Adam in the latter part of the century. This development proceeded so gradually, has been so entirely neglected by writers on Art, and is, indeed, so entirely ignored by most architects, that it may be worth while to follow it a little more in detail than in the case of the earlier and more explored centuries.

The English eighteenth-century chimney-piece, as I have said, was a revival of the type introduced in the seventeenth century by Inigo Jones. In Queen Anne's day its striking characteristics were a certain bold simplicity and massiveness. It was almost invariably of stone or marble, and did not, as a rule, extend above what we should call the shelf, but what was still looked upon as a cornice, and, indeed, often crowned with a pediment. A picture there might be, framed in the panelling over it, but not forming part of it. On rare occasions these chimney-pieces were monu-

mental, and decorated with sculpture of no mean merit; indeed, the spirited rendering of the small amount of ornament in most of them is remarkable. Of course these fine things were only for the great and wealthy, and in a large number of houses the late seventeenth-century type was still retained.

FIG. 169.—AT STOKE HALL, YORK.
(From a photograph by Mr. Bedford Lemere.)

The works on architecture published by Kent and Gibbs,* who practised early in the eighteenth century, contain a large number of examples of chimney-pieces, those by the latter architect especially showing very strongly the influence of French work of the Louis Quatorze-period; while one at least suggests the influence of the architect's somewhat extensive practice in Westminster Abbey (Rare Ben Jonson, to wit), and a small addition in the "Hic jacet" line would turn it into a very passable *monument* of the period.

In the reign of George I. the fashion of making these mantels in deal painted had become general, and while it placed them within reach of most, the facile material led to a great increase of ornament. The picture frame, too, finding a substructure of its own kin, allied itself thereto, and enlarging its boundaries became the over-mantel. An example is given [fig. 169] of one of these mantels from Stoke Hall, York; it is attributed to Grinling Gibbons, but this is scarcely borne out by its style. The decoration of the room

* *A Book of Architecture containing designs of Buildings and Ornaments.* By James Gibbs. Fo. Lond. 1728.

belongs to the period between 1720 and 1730; the old standard grate of about the latter period is still in use, but enclosed with modern ironwork; the beautiful sculpture of the marble jambs and head is scarcely to be discerned in the illustration.

Many of these wooden compositions with pictures of the Pannini School, and dating from about 1730, are marvels of elaborate wood-carving. Two good specimens are to be found at South Kensington Museum, and the famous example from Chesterfield House given here [fig. 170] is well known, and marks the acme of taste of the period.

Fig. 170.—At Chesterfield House.
(From a photograph by Mr. Bedford Lemere.)

All this time marble mantels continued to be made, increasing in beauty and richness of rare statuary and colour.

About 1740 the French "Rococo" taste began to prevail, showing itself especially in chimney-pieces, and chiefly in those of wood. At first it was applied sparingly in friezes, &c., the old lines being retained and most of the old ornament, though later "the scrolls and inverted C's," which so roused the ire of Sir William Chambers, began to overflow the sober English outline. Strange to say, the effect of the mixture was not unhappy, as may be seen in designs by Swann, 1745,*

* *The British Architect, or the Builder's Treasury of Staircases, &c.* By Abraham Swann, Carpenter. Fo. Lond. 1745.

where in the mantel the English rigidity still holds its ground manfully, while in the over-mantel—here become a picture frame—French levity runs riot.

In marble mantels the old style still prevailed, perhaps on account of the nature of the material; but when they began to be imported ready-made from France in the Louis-Quinze manner, and the eccentricities of woodwork culminated with Chippendale's manner, it seemed as if the old style were doomed.

A word as to these Louis-Quinze chimneys, of which many fine old examples exist in this country, and without a reference to which no review of artistic fireplaces would be complete. The one given is a good example of the simpler and earlier sort [fig. 171],

Fig. 171.—At the "Arts et Métiers," Paris.
(Reduced from a plate in the *Encyclopédie d'Architecture.*)

relying for its effect rather upon delicacy and subtilty of line than extravagance of ornament, the iron interior, too, being a notable advance in fireplace construction.

Abused by pedants and purists, distorted by ignorant pretenders, vulgarised by incessant copying, this Louis-Quinze style has never ceased to charm. It was the outcome and faithful reflector of the short but brilliant epoch that saw it run its course—the creation of three or four men of genius—the only original style of ornament there ever has been, or perhaps ever will be. It belongs to the middle of the eighteenth century, and should be left there; few there are who can even decently copy it, none may carry it further.

Of the style that succeeded it, the counterpart in England was that introduced by the Brothers Adam. Returning to the simpler forms of the earlier part of the century, they refined them, replacing their original robustness by elegance, and carving them

with delicate and exquisitely wrought imitations of antique Roman ornament. This style also has been much vulgarised by indiscreet copying, and does not appear to have been practised successfully by any one but its originators.

In their early work, as at Lansdowne House, the mantels retain a good deal of the boldness of the first half of the century, but their proportions became "fine by

Fig. 172.—At Brocket Hall, Herts.

"degrees and beautifully less," till at last little more than flat backgrounds for ornament, though they always had great refinement and some dignity.

A good example of the Adam type of interior is the saloon at Brocket [fig. 172], possessing a splendid mantel of statuary and coloured marbles with caryatid figures, and the grate complete just as originally designed.

The coal fire-grate as we know it really had its rise in this century, and progressed rapidly. The first example given [fig. 173] is from Blenheim, and is almost

entirely of wrought-iron, the bars and uprights being made after the fashion of columns; this, of course, belongs to the reign of Queen Anne. The second [fig. 174], somewhat later, is remarkable for the curved plan of the bars; it has brass vases, and

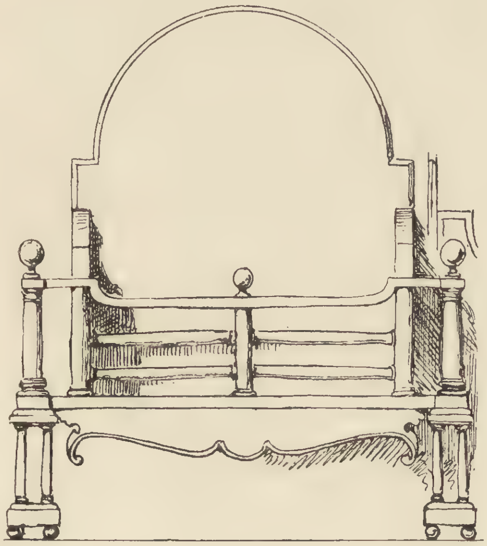


Fig. 173.—Grate from Blenheim Palace.

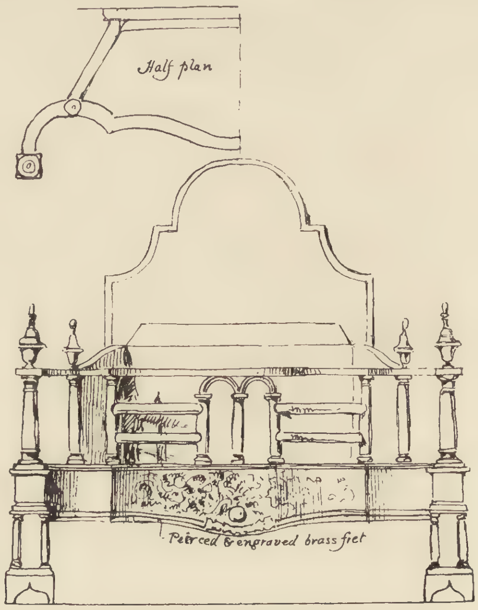


Fig. 174.—Grate (end of Queen Anne or beginning of George I.).

a pierced and engraved brass fret below the bars, and will be readily recognised as an ornamental development of the last mentioned. The third [fig. 175], dating from about 1750, is a notable advance in an artistic sense; the bars in front are of bright steel, the fret and standards of brass.

Fig. 175.—George-the-Second Grate.

These three are independent and movable grates, which were so invariably used at this time that grates were considered tenant's fixtures and moved about with the rest of the furniture. Most people are familiar with the standard grates designed by the Brothers Adam, and abundantly copied at the present day; the last example [fig. 176] is the parent of our modern register grate. It is also one of the "hob" grates so universally used till Count Rumford knocked them on the head in the present century. These early hob-grates are models of the artistic treatment of cast- and wrought-iron (the bars were

always wrought)—indeed, the Brothers Adam brought the art of grate-making to perfection, and were the first architects to turn their attention to such details. From costly burnished steel grates covered with delicate engraving, to humble cast-iron " hobs," all their productions have the charm of delicate invention and beautiful workmanship.

In France wood still continued to be the exclusive fuel, and accordingly fire-backs and dogs were brought to great perfection. The series of cast-iron backs given are characteristic of the Louis-Quatorze [fig. 177], Regency [fig. 178], and Louis-Quinze [fig. 179] periods respectively; the last has the congenial subject of David and Bathsheba, and is one of the finest of its kind extant.

The interior of the Louis-Quinze mantel will show how these backs were applied, with modelled covings and sides to match, the last just sloping inwards a few inches. Of the French eighteenth-century fire-dogs it is unfortunately impossible within the limits of this Paper to give any illustrations; they were in many instances strikingly beautiful, being made of brass and gilded, and remarkable for exquisite modelling and finish. Those of the Louis-Quinze epoch especially were most fantastic, and their designers seem to have let imagination run riot—shepherds and shepherdesses, sportsmen and their ladies, dogs, monkeys, cats, and Cupids, and every variety of animal, real or fabulous, figure thereon, perched on characteristic compositions of rock-work, &c. Not content with the " Chenet," they utilised the fender, then assuming importance, and seated thereon figures of Cupids, young satyrs, and the like. The fender, it may be noticed, is, in its modern form at least, a comparatively recent innovation, having apparently been first used in this country about 1750. It was originally almost always curved like a bow, and resembled the brass fret shown in the grate in fig. 175 turned upside down; it had no bottom plate, the hearths in the better houses being invariably of marble. In connection with the above remark, it may be noted that Charles Lamb, in describing Mrs. Sarah Battle's parlour, speaks of the " ante-fender " days as within his recollection.

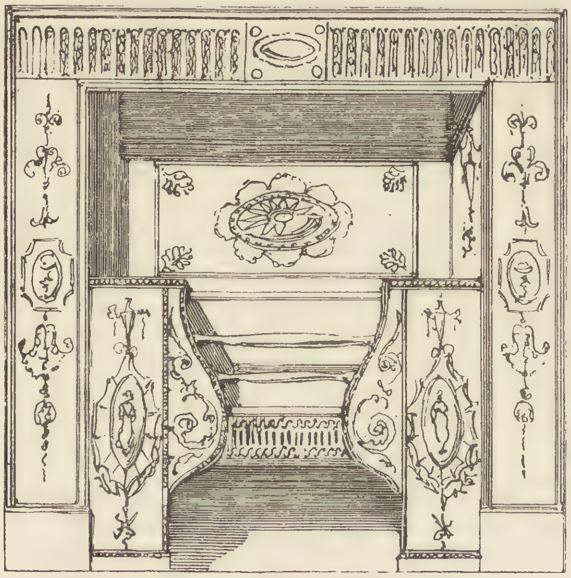


Fig. 176.—Adam enclosed Hob-grate in Cast-Iron, with Wrought Bars and Pierced and Engraved Steel Fret (*circa* A.D. 1770).

The end of the century saw a revulsion from excessive ornament to extreme rigidity and simplicity. The mantels of this period are almost invariably of marble—now become relatively inexpensive—and rely for their effect almost exclusively on much repetition of straight lines in delicate mouldings, reedings, and flutings. Thus

the way was paved in this country for the so-called Greek Revival at the beginning of the present century, which, indeed, may be called the "Century of Revivals"—a veritable chaos to the Art historian.

One revival treads on the heels of another with ever-increasing rapidity, and we appear to be re-enacting within the narrow limits of a hundred years all the successive Art epochs of the past. Greek, Mediæval, Italian, French, and Dutch Renaissance, so-called Queen Anne, and lastly Georgian, have followed one another in rapid succession; and, the cycle being almost complete, there are not wanting indications that the hand of taste will shortly point again to Greek.

Fig. 177.—French Louis-Quatorze Cast-Iron Back.

Early in the century, the fireplace sank to the lowest depths of degradation. Its cornice became a mere shelf, so lowered as to enable the exquisites of the Count d'Orsay stamp to assume their most telling pose whilst resting an elbow thereon. Many fine old marble and wood mantels bear cruel evidence of this perverted taste, having been mutilated by the removal of cornice and even frieze to make way for the fashionable low shelf. Perhaps one of the chief reasons for this was the adoption of the then French taste, which appeared to look upon fireplaces as necessary evils, and undoubtedly the substitution of mirrors for pictures over them greatly tended to the degradation of mantels. People thought it useless to have mirrors unless placed low enough to enable them to see if their curls or caps appeared to "set" properly.

Fig. 178.—French Regency Cast-Iron Back.

As to the Mediæval Revival, it may be broadly stated, in spite of brilliant exceptions, that it has not produced a chimney-piece worthy of notice. Even the genius of Burges seemed unequal to the task, and the immensely massive stone fireplaces with

which he endowed the principal rooms at Gayhurst Manor, in spite of their masculine design and excellent execution, have a cold and utterly unsympathetic appearance, which is greatly enhanced by their incongruity with the homely Georgian rooms in which they are placed. They certainly vindicated their Mediæval character in one point, for they smoked dismally, a defect now cured by iron canopies and other expedients.

In modern attempts at Mediæval fireplaces—other than simple reproductions of old forms—it appears generally to have been ignored that a fireplace in this style

Fig. 179.—French Louis-Quinze Cast-Iron Back.

must be structurally complete, and an integral portion of the building, and that no chimney-piece, however costly or elaborate, clapped on the face of an ordinary brick opening, whether clothed internally with tiles or not, can be regarded as in any sense carrying out the Mediæval idea.

The wholesale importation of cheap marble mantels from Italy and Belgium, and the custom of building up apparently massive structures in their slabs of machine-worked marble, led to a general disgust with and disuse of this material, and wood mantels became, and still remain, fashionable. This is in many senses a change for the better, though the nobler material, if nobly treated, must surely produce the finer effect; and it can scarcely be argued that the American walnut productions of

Tottenham Court Road constitute any great artistic advance on their hollow marble predecessors.

Amongst other revivals, the hooded chimney has had its turn, and still has many admirers, though its great practical drawback—smoking—especially when used at the bottom of a ridiculous 9-in. pipe flue, has generally led to one of two courses being adopted: either an iron funnel is added inside the stone one and partly enclosing the grate, or else the fireplace is made in the usual way, with the useless canopy-hood paraded in front of it, and shamelessly lying to all beholders. No amount of artistic beauty of design and execution (and both have frequently been strikingly present) can palliate such a sham as this. The modern "ingle nook" has also the same vice; it is a funnel within a funnel, the one real, the other a sham and useless. The placing of the fireplace in an architecturally contrived recess is thoroughly justifiable from an artistic point of view, though in practice it seriously decreases the general comfort of the room to add to that of a corner of it; but the less such an arrangement apes the ingle nook of the old farmhouse or inn tap-room the better.

There has been much said and written of late years concerning the improvements of taste in interior decoration, and with a good deal of truth, and the great activity in this direction is in itself a healthy sign; but the judicious observer of the Art movement in the latter half of this century will probably come to the conclusion that we should have made better progress had we hurried less. We have been too ready to believe our fathers were fools and Philistines, while giving credit to our great-grandfathers or earlier ancestors for artistic qualities and intentions quite foreign to their simpler minds. It has sufficed for any one to abuse what is, and to praise what has been, and he is at once an apostle of culture. Our fireplaces bear ample evidence of this; we would have them Mediæval, Elizabethan, Queen Anne,—anything rather than Victorian.

The one genuine nineteenth-century feature connected with the fireplace is the *étagère*. It having occurred to some collector of china-ware to exhibit his choicest specimens on brackets and shelves over his fireplace, and to give them silvered glass backgrounds, in order that they might be the better seen, the idea—excellent for its purpose—was seized upon and made into an article of faith. For those who had fine specimens of china or glass to display all was well; those who had not must buy their *étagère* first, and fill it with something afterwards. Provided it had bevelled plates it was orthodox, but there was no salvation without the bevels. Rapid was the rise of the *étagère*, and rapid has been its fall—it being now practically banished to the suburbs.

Finally, what are the lessons that may be learnt from the artistic history of the fireplace? The first undoubtedly is that practical utility should take precedence of all other considerations. Secondly, the hearth in this country is the focus of the room—indeed, the two words are synonymous—and the fireplace should be so treated as to give the keynote to the whole decoration, and form a worthy centre to it. Thirdly, the treatment of the fireplace should be perfectly ingenuous; and on this

ground it is perhaps to be preferred that the chimney-breast should project into the room (where this is the case, and decoration is in any degree elaborate, it ought perhaps to embrace the whole of the chimney-breast). Fourthly, if any real progress is to be made, all the past history of Art teaches us that it must be very gradual. We must take, to begin with, the most efficient form for the purpose in view—namely, diffusion of warmth—and patiently endeavour to improve on and beautify it, sternly rejecting all that is inconsequent, not striving after mere originality, and not ashamed to copy one another. Thus, and thus only, were new types evolved in the past; and thus, and thus only, can they be evolved in the future.

CHARLES E. SAYER.

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